RAILROAD GAZETTE

FRIDAY, JULY 14.

MASTER MECHANICS' ASSOCIATION.

Reports and Discussions at the Convention.

We continue this week the publication of the reports and abstracts of the discussions at the recent convention at Niagara Falls, as follows:

THE JOY VALVE GEAR.

(Abstract of a paper read by Mr. David Joy, of London, England.)

Gentlemen: With the distinctive features of this valve gear I believe most of you are more or less familiar. The majority of you have had diagrams and descriptions placed in your hands. It has also been widely commented on, illustrated and described by the railroad and mechanical journals, notably in the *Railroad Gazette* of Jan. 13 and the *Railway Review* of May 6 last. I do not, therefore, now propose to take up your time by repeating what has thus been widely published, but rather to continue the subject down to the present time.

This gear was originally devised for marine engines, but it may easily be applied in almost every conceivable form to suit not only locomotives but land engines, launches, rolling mill traction, steam plow, hoisting and other engines, to all of which varieties it has been successfully applied in England. When I undertook to apply it to American locomotives, I was pleased to find that they really seemed to have been actually designed by anticipation for the reception of this gear. For instance, the valve chests are placed on the tops of the cylinders, whereas in the case of English locomotives they are put between the cylinders, so that an English master mechanic on taking up my gear has to entirely alter the type of engine to which he is accustomed, but which they have not hesitated to do to secure the advantages attending the use of this gear. As applied to American locomotives, I laid it out very simply, and without any alteration of the framings, or, in fact, any other part of the engine.

A question has been raised whether the swaying of the engine would not produce a rise and fall of the connecting rods, including that part of them from which the motion to actuate is taken. This question was originally raised by Mr. Webb, the Superintendent of Motive Power of the London & Northwestern Railway, when he first commenced to apply the gear to his engines. For upwards of six months he and I exhaustively investigated this particular question, using full-sized models, and he eventually concluded that the error arising was so slight and imperceptible as to be unworthy of notice.

Now, as to American locomotives. The use of equalizing levers between the springs, allowing one wheel to take up a part of the motion from the other, seems to imply that ordinarily there may be more movement of the axle-boxes here than on English roads and that a varying action occurs at the crank end of the connecting rod, though the other end has no motion. The amount, consequently, of which we should have to treat would be the amount existing at the point from which we take our motion for the valve, being one-third to two-fifths of the amount of the motion at the pedestals. To meet this case, if it is desired to overcome any slight disturbance, I have designed a frame to carry the center of the quadrant lever, *i. e.*, a slide case carrying the block in which the valve lever has its fulcrum. This frame is fixed at the crank end to the axle-box, and at the other end pinned to the frame at a point at a distance equal to the length of the connecting rod. The frame, consequently, will move with the axle-box and will give to the center of the slide case a vertical motion exactly equal to the vertical motion of the connecting rod at the point where the motion is taken to actuate the valve. Therefore, any irregularities arising from the action of the axle-box on turning curves or from uneven track is thereby entirely eliminated.

English locomotive superintendents, after closely studying this question, have unanimously come to the conclusion that no perceptible disturbance exists, and in proof of the good faith of this opinion, and of my statement in regard thereto, I adduce the fact that they and others are now generally specifying this gear for locomotives, for use both in England and in the British colonies, and also in Central and South America. For use outside of England they are specifying in all cases outside cylinder engines of the American type, and, indeed, almost exactly like your own.

The railroads in the British colonies are, as to track, the counterpart of western American railroads, and I am able to put my finger on the fact that reputable engineers have, for these colonial railroads, after investigation of the merits and demerits of this gear, adopted it, and have now actually arranged for a large number of locomotives of American pattern fitted therewith, forty of which are either now completing or have already been built and despatched. I am tolerably sure you will feel that there is some foundation for my claim that even without the frame described (and which has in no case been used), there is no ground for fear of failure on the score referred to.

The Consulting Engineer of the Indian State Railways, which for dustiness are unequaled, and which are possessed of all kinds or irregularities of roadbed, has likewise entered into an agreement with me covering the use of my gear thereon. How similar they are in regard to track to many of your own railroads, may to some extent be realized from the fact they find it necessary generally to use equalizing levers, with which you are not unfamiliar.

I now refer to one of the advantages of this gear, which seems to be frequently overlooked. The action produced by this motion is really a series of accelerations and retardations of the motion of the valve. The first acceleration occurs at the commencement of the admission of steam, and causes the port to suddenly open wide, whereupon the retardation immediately occurs and the valve is held wide open until the proper time for the second acceleration arrives, viz.: at the point where the valve begins to close. A much sharper cut-off than is given by the link motion is thereby attained. Thus, although a shorter stroke may be given to the valve and a less absolute opening, you will get during a given cut-off as much steam into the cylinder, because the action of the valve, though entirely free from jerkiness is more like that of a tappet valve, opened instantly, then resting full open, then suddenly closing—consequently by retaining the same lead as is now given for a link gear *at the point where most of the work is done* a much better port, more quickly opened and closed, is obtained than can be accomplished with the link gear.

I may mention that I have just designed the gear for some large fast passenger engines with 18 in. by 24 in. cylinders and four 7 ft. coupled wheels. In this case I am getting a full opened port of 1⅛ in. at 80 per cent. cut-off, and a constant lead of three-sixteenths.

As to compression with this gear owing to the peculiar movement given to the valves (that is, the series of accelerations and retardations) while the lead is opened later but quicker, so is the part shut for compression later but quicker, leaving the alternative if wished, of adding lap on the exhaust side, thus retaining the action of the steam a little longer, and getting the same compression as with a link motion, or as in the case of marine engines, doing away with the necessity of a special expansion valve, and allowing the main valve to be used for expansion, as the compression is not enough even at a cut-off of .25 to injure the action of the engine. In proof of this I may mention that the British Admiralty are now having constructed two pairs of engines for a twin screw-armored vessel with my gear, each pair to indicate 2,500 horse-power, and which engines will depend entirely on their main valve for the cut-off.

For river service in the East Indies this gear is being used by the government on large and fast dispatch steamers. Nine such are now being built from the same patterns. It has also been applied to rolling mill engines, in one case with 60 in. cylinders and 4 ft. stroke, where, in rolling steel, repeated and rapid reversals are constantly occurring, and these engines are also often run at high degrees of expansion when finishing the billets.

The statements which have been made as to the rapid admission and exhaust of steam have always been verified by the squareness and fullness of the indicator diagrams many specimens of which I have received from various quarters.

DISCUSSION.

Mr. S. J. HAYES wished to know the advantages of this new departure in substituting for link motion this valve gear which takes its motion from the connecting rod, whether there is a saving in fuel and whether an engine will do more work with the Joy valve gear than with the link motion.

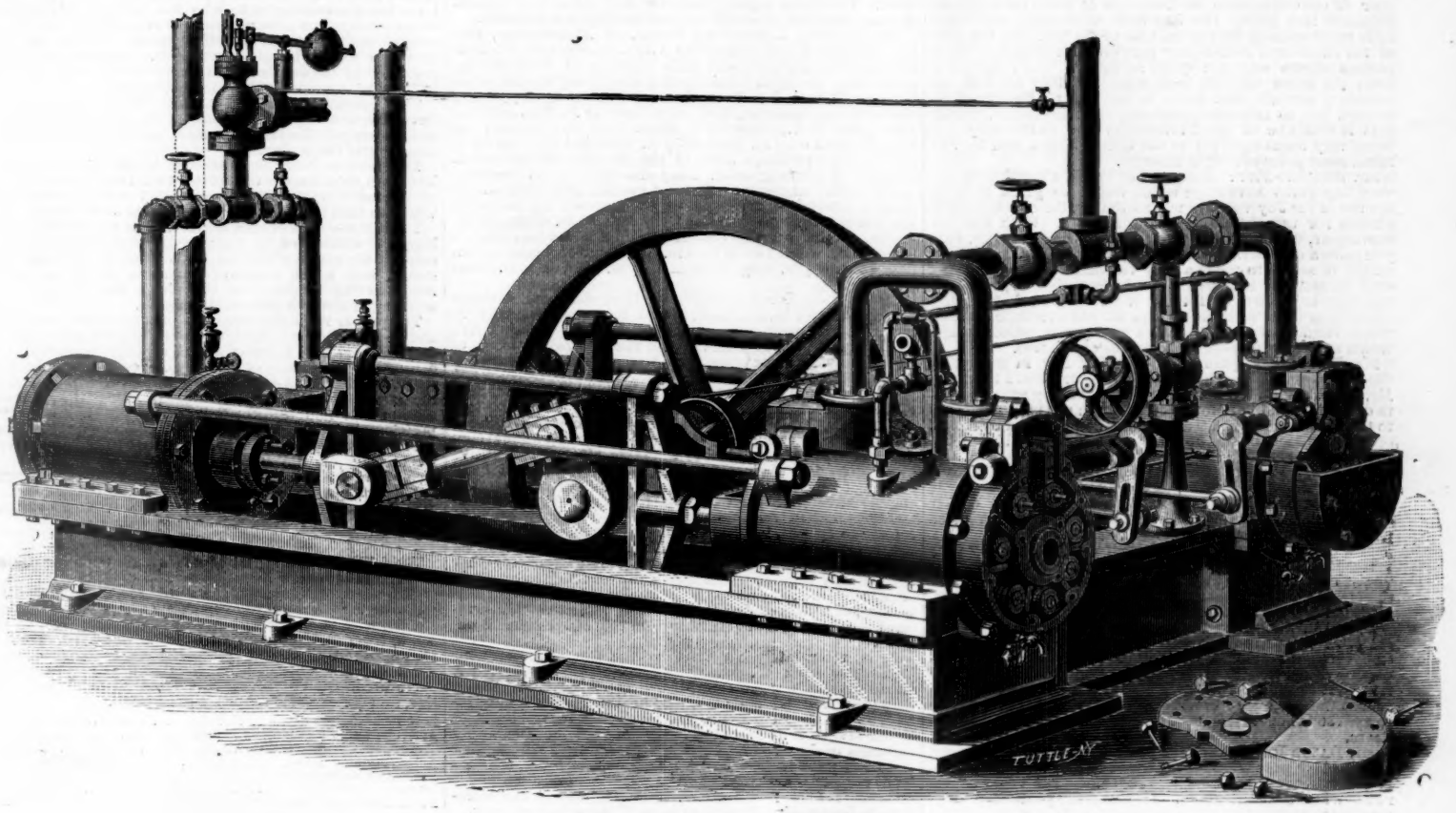
Mr. DAVID JOY: Mr. Hayes has kindly given me an opportunity of stating what I think are the advantages to be gained by this gear. First: the change involves very little alteration, indeed, of your engine. I have laid it out so that this gear can be adapted to any existing engine simply by clearing away the eccentrics and attaching to the slide bar bracket a bracket to carry my gear so that you can really take any one of the existing engines and adapt this gear thereto for simply the cost of the gear. Mr. Hayes next question was whether any saving in fuel resulted. We have not yet made any experiments in this direction. The first engine has been running about two years and we know from our experience of that that we have got a more perfect valve gear, and, other circumstances being equal, we ought to make a saving of fuel. My chief objects, however, in arranging this gear were to make other savings. My gear is less costly. For marine engines it will cost 30 per cent. less. In your engines the saving will be a great deal more, because we save the weight bar shaft and levers in addition.

I have already explained that I can give a perfect cut-off forwards and backwards and at all points cut off, and it gives a sharper admission and a sharper cut-off for the steam. Now, I believe most of you admit that a tappet valve, or any valve which suddenly opens and suddenly cuts off the steam, is the best valve to employ to admit and cut-off steam. With this valve gear I approach to the action of the tappet valve gear. But I have no jerks and no jumps. This arises from the fact that the motion given to a valve with lap and lead consists of two distinct parts, the one part being that portion of the throw which draws the lap and the lead, the other portion being the amount of opening given to the port. Now by my gear each of these parts of the motion are given by the functions of different parts of the machinery and so may be controlled and proportioned separately, the lap and lead are opened by the lever action of the valve levers, the port is given by the incline of the curved slide in which the center of that lever slides and depends on the angle given to that incline. It follows that when these two actions are in union, the motion of the valve is very smart, and this occurs when steam is being admitted. There then follows a period of opposition of these motions and the valve almost dwells, as this corresponds to the moment when the valve is fully open. A further period of unison follows and this gives the smart cut off.

Next, the gear is all outside of the engine and can be touched when standing alongside without any reaching over to the inside or from the running board.

Further, it leaves more room under the boiler and you can put in 10 or 12 inches more fire box between the same frames than with the eccentrics for which room ordinarily has to be left.

Again, it never needs reversing. With this gear I always



CLAYTON DUPLEX AIR COMPRESSOR

Built by the Clayton Steam Pump Works, 14 and 16 Water Street, Brooklyn, N. Y.

[*For Description, see page* 423.]

leave a blank place with a spring preventing your going into that part unless you need it, so that if the engine will not start when the lever is at its furthest notch it is only necessary to push the lever further over into the blank space to get 80 per cent. to 90 per cent. cut-off, and the engine will always start with 90 per cent.

Again, it has considerably less compression than with the link gear when cutting off with 25 per cent. length of the stroke. With the link gear and the ordinary lap of an inch you begin to compress it at 46 per cent. of the stroke. With the Joy gear you only begin at 30 per cent. with the same valve and the same lap. If, however, this compression is not considered sufficient for fast-running engines, it is only necessary to add a little lap on the exhaust side of the valve to get any required compression, and in doing this another advantage is gained at the same time, the steam is held longer in the cylinder for expansion. These are really the important advantages that I think of at the moment, and this I hope will be satisfactory to Mr. Hayes.

Mr. FRANK M. WILDER: The Secretary has a diagram, prepared by Mr Reuben Wells, showing the action of a valve with the Joy gear and with the link gear.

Mr. J. N. LAUDER: I have examined this diagram and, I think, it shows very plainly that the two valves, the Joy and the other, are very perfect. You will notice, perhaps, in examining it, some few points where they vary, but they run generally very close. The Joy valve gear, however, holds on to the steam somewhat longer when linked up.

Mr. FRANK M. WILDER: In looking over this diagram of Mr. Wells, I was struck with the closeness with which the lines of both gears follow each other.

Mr. SETCHEL: This diagram shows the opening of the steam-ports, the lead at the commencement of the stroke, the expansion, points of cut-off and so forth of the Joy valve gear as compared with the Louisville & Nashville Railroad standard link gear. The Joy valve movement, showing a little more opening than in the case of the link gear for part of the stroke and on the other part of the stroke showing a portion of the way not quite so much. The diagram is from the same valve in both cases, and they are both exceedingly perfect. Mr. Wells in sending me that chart requested me to take an opportunity of exhibiting it, feeling that it would be of great interest to you, as the subject is being very much agitated in the United States, and he had taken some pains to look it through.

Mr. HOWARD FRY: I should like to call attention to one very important advantage which would be given to us by the use of the Joy valve gear, and that is, the opportunity it affords for the extension of the fire-box. With the Joy valve gear, doing away as you do with the eccentrics, etc., you have a considerable extension permitted of the fire-box, which it seems to me is a very valuable feature connected with it, and one that should not be lost sight of; and if it can only be shown, as I think it certainly is, that the Joy valve gear is, at least, as good as the old eccentric motion, this advantage of the fire-box is a pretty decided advantage which the Joy gear possesses over the old motion.

Mr. SETCHEL: I quite agree with Mr. Fry in regard to the advantage of lengthening the fire-box; and I think, as Mr. Fry has said, that admitting that the Joy gear is equal in durability and in point of economy in working the steam to the eccentric motion, that the advantage gained by means of the adoption of the Joy valve gear in lengthening the fire-box is certainly a step in the right direction.

Mr. J. N. LAUDER: That diagram shows very little advantage one over the other, especially in the admission. It is marvelous that the admission and the points of cut-off should run so nearly parallel with each other—at some points the Joy gear a trifle ahead, at other points the link gear a trifle ahead. In the matter of exhaust, the Joy gear is manifestly ahead working at short cut-offs; working at 75 per cent. cut-off, say at 6 inches, the Joy gear holds on to the steam an inch longer than the link does. That, I think, gives the Joy gear, working short, the advantage.

Mr. F. M. WILDER: I understand that Mr. Fry and several other gentlemen went to Reading, Pa., last week, and examined this gear as applied to an engine on the Philadelphia & Reading Railroad, and there they found on actual trial that to get the full beneficial results of the Joy valve gear it was necessary to have a shorter lap, and advisable to use the Allen valve—that is, get a double admission of team.

Mr. DAVID JOY spoke of the perfection of the results got in American practice with the link motion, saying that he had seen in the American shops refinements of it that he had never witnessed in England. He asked the gentlemen to remember that they could not expect instantly to get the maximum advantages from the Joy gear, and quoted Dr. Siemens' remark that "I think that the link motion is doomed and that we shall have something like this Joy gear in place of it."

Mr. L. B. PAXSON produced a telegram from J. E. Wootten, Esq., which read as follows:

"PHILADELPHIA, June 21, 1882.

"*To L. B. Paxson, International Hotel, Niagara Falls:*

"Engine No. 411 doing well. Hauled 17 loaded (passenger) cars. Can take 20 quite as easily as with link motion."

Mr. DAVID JOY: By the courtesy of Mr. Paxson I shall be enabled within a few days to take indicator diagrams rom this engine, and which will be at the service of the sociation. Mr. Paxson will furnish them.

IMPROVEMENTS IN LOCOMOTIVES.

To the American Railway Master Mechanics' Association:

Your Committee appointed to report on the subject assigned them, viz: New Plans of Construction and Improvement of the Locomotive Engine, beg leave to present the following report:

The following letter: "Will you kindly furnish me with any information, plans, photographs or tracings, of any locomotive (different from regular standard engine) you have built during the past year, accompanied with records of their performances and where located at present. Also tracing of any new appliances or changes you have made that have proved to be of value, and have increased the efficiency of the locomotive. This information is solicited in order that the Association may have records of the progress made from time to time in the improvement of the locomotive," was sent to quite a number of master mechanics and locomotive builders asking for information on this subject, and we have received 17 replies to the above letter.

The past year does not seem to have been a year of marked progress or special improvement of the locomotive engine; probably our master mechanics, locomotive builders and inventors are satisfied with the present attainments made in the line of progress in the locomotive; however, your Committee find that there are a number of improvements under way which require time to develop, a few of which we may notice:

The Fontaine locomotive which was referred to in our last annual convention, and to which we were looking for further developments during the past year, seems to have failed to produce the results which were looked for, and the "Keely Motor" has not made that wonderful trip from Philadelphia to New York which we have been anxiously waiting to see; yet we find that there is substantial progress being made by our master mechanics and builders in getting up *good* and *substantial* engines, adapted for everyday work on fast passenger trains, and also designated to haul the heavy cars which our railroad managers have introduced on all the leading railroads of late, which would *tax* the power of an engine built a few years ago.

Mr. A. B. Underhill, Superintendent of Motive Power of the Boston & Albany Railroad, has made a new departure in locomotive practice, in building locomotive boilers to carry a working pressure of 160 lbs. per square inch, but intends to carry 175 lbs. if he finds it necessary. Mr Underhill furnished your Committee a set of blue prints, giving a full and complete description in detail of the construction of these boilers; one of this class of engines is in service and thus far have given very satisfactory results.

Mr. Howard Fry, Superintendent of Motive Power of the New York, West Shore & Buffalo Railway, furnished your Committee with a tracing of the location of arch-pipes and deflector as designed and used by him while engaged on the Philadelphia & Erie for the prevention of smoke in locomotives burning bituminous coal; he says that it is well known that the English practice is to introduce iron deflecting plates over the fire door.

These plates burn out very rapidly even in England, where the consumption of coal per foot of grate service is less than on American locomotives and in American practice; these plates have been found to last so short a time that their use has been discontinued.

The Pennsylvania Railroad's method of supporting the brick arch on water tubes suggested a very convenient plan for carrying the brick deflector over the fire door, running the two centre water tubes into the back sheet instead of into the crown sheet, leaving the two side tubes in their usual places, and then continuing a narrow row of bricks on the two centre tubes from the brick arch back to the back sheet. This forms a good deflector and with it a careful fireman can keep up steam without making much smoke.

The Baldwin Locomotive Works, of Philadelphia, Pa., have furnished your committee with a photograph of a class of locomotive designed and built by them at their works, called the "Decapod" class having 10 driving wheels and a pony-truck, cylinders 18 in. diam. and 20 in. stroke, driving wheels 37 in. diameter, total wheel base 18 ft. 8 in., driving wheel base 13 ft., boiler 54 in. diam., flues 16 ft. and ⅛ in. long, fire-box 50⅛ in. long, 48⅛ in. wide und 55⅛ in. deep; the fire-box overhangs back of the driving wheels and is adapted for burning wood. They also make a narrow-gauge consolidation engine with fire-box overhanging back of the driving wheels also arranged to burn wood; the following are the principal dimensions: Cylinders 16 in. diam., 20 in. stroke, driving wheels 37 in. diam., total wheel base 15 ft. 5 in., driving wheel base 9 ft. 9 in., diameter of boiler 52 in., flues 13 ft. 3¾ in. long, fire-box 43⅛ in. long, 48⅛ in. wide, 54⅛ in. deep.

The Baldwin Locomotive Works have designed a steam reverse gear for locomotives; one of the same has been in service for the past year on engine No. 169, a locomotive built for fast passenger service, for the Central Railroad, of New Jersey. This reverse gear has worked very satisfactorily and is still in service.

The Chairman of your Committee presented a photograph of a class of locomotives designed especially for fast passenger service, built at the Baldwin Locomotive Works; a reference to these engines was made at our last annual convention. He would also state that this class of locomotive have performed their work very satisfactorily and have fully met our expectations. Six more of the same class of engines have just been placed on the road. The improvements consist in the boiler being placed directly over the top of the frames, insuring large grate area, also design of the frame, and equalizing arrangement with driving springs, etc. The driving wheels have been placed closer together than usually is done, which lessens the tendency to breaking of parallel rods; the parallel rod is also made wider in center, and of a neat design made of steel, as are also the principal wearing parts of machinery, on the above class of engines.

In a letter lately received by the Chairman of your Committee from W. W. Evans, associate member, Mr. Evans presents a sheet showing the comparative profile of mountain railroads and says, that he thinks it would be interesting to the members of the Association to see how high locomotives are run in Peru above all the other railways in the world. On the railway in Peru running from Arequipa to Lake Titicaca there are 70 miles, that are more than 16,000 feet above the sea and nearly the whole distance is bare rock. Mr. J. E. Martin, one of our members, is Locomotive Superintendent of the above railway.

Mr. L. B. Paxson, Engineer of Machinery on the Philadelphia & Reading Railroad, furnished your Committee a very compiete set of blue prints and photo-lithographs, with description of details, etc., showing the standard engines as used on their road. As shown, these engines differ somewhat in their construction from the ordinary engines in railway service, the principal feature and departure being in the design and construction of the boiler. This boiler was designed by Mr. J. E. Wootten, at present General Manager of the above railway, and is the standard boiler for this road; the above class of engines are especially adapted for burning anthracite coal, they are in continuous service and their performance is very satisfactory.

Mr. Paxson says that they have lately introduced the steam reverse gear on the above engines as designed by Mr. Good and styled "Good's Steam Reverse for Locomotive Engines." This steam reverse differs from the one previously referred to, in that it has only one cylinder instead of two; the above is now being applied to the engines on this road and is working very satisfactory.

Mr. G. E. Boyden, Superintendent Motive Power & Machinery, of the New York & New England Railroad, furnished your Committee with blue print showing plan of making fire-door opening by flanging the sheets. He says that in twelve years continuous service with the above, he has found no trouble with the same; while this device is not new, yet it shows the result of practical use of the same.

The attention of the master mechanics in the United States has been lately directed to what is known as "Joy's Patent Reversing and Expansion Gear," as applied to locomotives. This invention, as shown, dispenses with the links and eccentrics as now in present use, and is operated from a connection on the main rod. So far as known to your Committee, this arrangement has been only applied to one locomotive in this country, viz: on engine No. 411 on the Philadelphia & Reading road. Through the kindness of Mr. L. B. Paxson, Engineer of Machinery of the above road, the Chairman of your Committee was permitted to ride on this engine while on a trial trip made recently between Philadelphia and Bound Brook. This engine has been placed in regular passenger service, in order to make comparative tests of this improvement.

Your Committee have received a very new and novel design for the prevention of breaking of parallel rods styled "Strong's Locomotive Driver Coupling."

As one of the difficulties to be surmounted in running fast passenger trains is some device or plan that will prevent the rods from breaking, the above is worthy of attention. We also present blue prints of a heater and purifier adapted for the locomotive.

As the attention of the convention has been called to the matter of carrying high pressure of steam on locomotive boilers, your Committee present a new design of boiler, which has some very important features in it, particularly as there is great strength as shown in its construction, there being no flat surfaces, and another feature is in the manner of providing for the combustion of the gases. This boiler has not as yet been in practical service, but is no doubt worthy of notice.

In conclusion, your Committee will say they have endeavored to collect and present what is thought to be worthy of notice, so far as it was possible to do so; they would recommend that the reports and accompanying blue prints and photographs be printed in the annual reports; they also recommend that this subject be continued.

Yours, very respectfully,

WM. WOODCOCK, Chairman.

The following letters are appended to this report:

GOOD'S STEAM-REVERSE FOR LOCOMOTIVE ENGINES.

This steam reverse gear has been designed for locomotive engines for the purpose of giving relief to the engineer, and promptness to the reversing movement of the engine. Among its claimed advantages are: "Simplicity, freedom from derangement, cheapness of construction, minimum effort on the part of the engineer to reverse his engine, and also his automatic movement of the reverse lever; which if simply started will continue its movement in that direction, until by dropping the latch into the quadrant notch at the desired point of cut-off, its further movement will be arrested, and the link-gear of the engine will simultaneously be adjusted to the position coresponding with that of the reverse lever, and will remain fixed in that position until further change is made by the reverse lever."

By this it will be seen that not only is the link-gear of the engine moved by the steam reverse, but also the reverse lever has communicated to it by the peculiar arrangement of the reverse gear, the necessary force to move it in the desired direction without any effort on the part of the engineer save that of simply starting it. Another advantage possessed by the device is that the reverse lever is operated in the same manner as those in general use.

The apparatus consists of a steam cylinder provided with two induction and one eduction ports, steam valve, piston and piston-rod, the last connected to the reverse arm of the link-gear of the engine.

The reverse lever is connected by the reach-rod to the lever, which in turn is connected with the reverse arm, and at its lower extremity is connected with the valve-rod, which in turn is connected with the arm of the steam valve.

The piston-rod is of such diameter and its glands of such length as will afford the necessary resistance to the movement of the piston while the locomotive is working under steam, and which resistance must be in excess of the reciprocating tendency of the piston and rod, due to the working of the link-gear of the engine.

The proper resistance upon the piston-rod can be adjusted and maintained by tightening up the glands upon the piston-rod from time to time; and if, through neglect or other cause, the resistance of the piston-rod is not sufficient for the force of the link-gear, then will the valve movement of the steam reverse automatically produce the necessary resistance to maintain the link-gear of the engine in a fixed position.

This steam reverse gear has been applied to a number of locomotives on the Philadelphia & Reading Railroad, and they have in every instance given the most satisfactory results. There are at this time a number of engines under construction at the works of this company at Reading, to all of which this reverse is being applied.

STRONG'S PATENT HEATER.

The following is a report of a test made upon the Chicago & Alton road under direction of Mr. William Wilson, Superintendent of Machinery: I would respectfully report the following as the result of evaporative test, made with engine No. 50, with G. S. Strong's patent heater attached, on train No. 5, from Bloomington to Chicago, May 16, 1882, and also, of a test of same engine without heater attached, on April 29, all conditions being equal as nearly as possible.

Train consisted of seven cars from Bloomington to Pontiac, and six cars from Pontiac to Chicago.

Left Bloomington at	9.38 a. m.
Arrived at Union Depot in Chicago	2.20 p. m.
Time spent at stations, etc	41 minutes.
Actual running time	4 hours and 1 minute.
Pounds of water used	43,510
Pounds of coal used	8,233
Pounds of water evaporated per pound of coal used	5.28

TEST WITHOUT HEATER.

Left Bloomington at	9.34 a. m.
Arrived at Union Depot, Chicago, at	2.20 p. m.
Time spent at stations, etc	42 minutes.
Actual running time	4 hours and 4 minutes.
Pounds of water used	44,770
Pounds of coal used	10,675
Pounds of water evaporated per pound of coal used	4.19
Saving in coal	2,442
Increase in evaporation	1.09
Making a saving in favor of heater about	22.8 per cent.

LETTER OF MR. P. H. DUDLEY.

The practical performance of the American Fast Express Locomotive of to-day far exceeds what was thought possible ten years since, and we know from experience that the improvements you are constantly making will increase its speed for heavy trains.

If the data in regard to fast 10 and 12-car trains were all collected it would leave no doubt as to the ability to run them at 50 miles per hour, on nearly level roads, or five and six cars at 60 miles.

Having drawn with my dynagraph car fast express trains upon various roads, I present a brief tabulation of part of a trip, showing the performance of an ordinary locomotive upon a train composed of three 8-wheel, and six 12-wheel cars, weight 250 tons, total weight of locomotive, ready for the start, 126,000 lbs., distributed as follows: tender 54,000 lbs., engine 72,000 lbs., 48,000 lbs. being upon the drivers, which were 6 ft. in diameter, cylinders 17 by 24 in., steam pressure gauge set at 135 lbs.

The first column shows the number of miles; the second, the time of run in minutes and seconds; the third, speed in miles per hour; the fourth, velocity of the wind in miles per hour; the fifth, approximate grades; the sixth, foot pounds of work, shown by the dynametrical curve, in drawing the cars per mile; the seventh, foot-pounds per minute expressed in horse power; the eighth, approximate calculated foot-pounds of work required to move the locomotive itself, expressed in horse-power; the ninth, the sum of columns seventh and eighth.

Column 8 will vary with every locomotive and could only be determined by direct experiment.

In starting the train, the locomotive would record a tension of 11 to 12,000 lbs. for one or two hundred feet of distance then by hooking up the cut-off and other causes would reduce to 2,800 to 3,000 lbs. when the speed of 50 miles an hour was attained in the fifth mile. As the speed increases, the resistance of the air against the locomotive becomes greater and more of its own power is required to move itself, and less can be used to draw the cars. The increased foot pounds of work in the first four miles, show less than one half of that required to overcome the inertia of the train, for

the speed of 50 miles per hour. Inertia is an important element of train resistance, especially on local trains, as it limits the speed for short runs and must be considered in choice of locomotive for the service. In starting a train the working adhesion of the steel-tired drivers, on dry steel rail, is usually above 33 per cent. of the weight upon them, and reduces as the speed increases, but in what ratio, not ascertained by experiment. From 18 to 20 per cent. has been obtained at 56 miles per hour, the percentage of slip not exceeding 1½ per cent.

The great and substantial improvement in the permanent way, of late years, permits a higher percentage of adhesion than formerly.

One of the most important features shown in the tabulations, is the quick steam generating capacity of the boiler, 800, 900 or 1,000 horse power developed in the brief time of one minute may be expressed in figures, but the mind fails to gain any adequate conception of the enormous power. At 135 lbs. steam pressure, 300 or 338 lbs. of water will be evaporated per minute with a consumption of 40 or 50 lbs. of coal; this requires a very rapid generation of heat, and its quick absorption by the water.

Owing to the large amount of heat which is absorbed by the water, before it makes any pressure of steam, a less proportion of heat units are required to do the work at high pressures than low, therefore the rate of transmission per minute will be less for the heating surfaces.

The Swiss and German locomotives are reported to carry from 165 to 180 lbs. pressure as a rule, with exceptional ones at 225.

In drawing fast and heavy trains on various roads the greatest difficulty in making time has been want of steam. There are so many contingencies which may daily arise, of winds, storms, etc., that provision must be made for a greater capacity than is required for ordinary occasions. In observing what the train resistance would be, for the above mentioned train, about 11 lbs. per ton, it must not be concluded that this would also be true of any other weight of train; the resistance of the same number and class of cars increases in same ratio as the speed increases; and as we increase the tonnage number of cars, the amount per ton decreases.

Another important element of train resistance is the condition of the track; having upon my instrument, apparatus for mechanically determining the condition of the track, it is found even on the best roads, each mile cannot be in equal condition, owing to increased wear and quality of rail. On grades is this especially the case, and at stations where many trains stop and start. Experiments upon all classes of passenger trains are too limited to give any reliable formulas for general use. For long and heavy trains I have found the resistance per ton much less than that given by the latest formulas.

Yours truly,

P. H. DUDLEY.

1.	2.	3.	4.	5.	6.	7.	8.	9.
No. of Mile.	Time in minutes and seconds per mile	Speed in miles per hour	Velocity of the wind in miles per hour	Approximate grades	Foot lbs. of work, shown by dynametrical curve per mile	Foot lbs. of work per minute expressed in horse power	Approximate calculated ft. lbs. of work required to move the locomotive in horse power	Sum of columns 7 and 8
1	2-54	20.68	....	Level.	24,116,233	252	....	..
2	1-34	38 31	6.	Down 5.3	20,035,253	369	221	590
3	1-22	43.90	4.	Down 5.3	17,763,214	398	292	690
4	1-16	47.34	3.	Level.	15,904,273	383	418	791
5	1-11	50.70	4.5	"	14,871,528	382	406	788
6	1-13	49.31	6.	Up. 13 ft.	15,284,616	383	406	789
7	1-11	50.70	6.	Down 18 ft.	14,458,430	369	426	795
8	1-08	52.89	5.	" 13 ft.	13,219,106	354	451	805
9	1-07	53.70	5.	" 8 ft.	11,566,744	319	483	802
10	1-09	52.10	5.	" 5 ft.	11,773,293	310	441	751
11	1-08	52.89	4.2	Level. Down	11,773,293	316	447	763
12	1-09	52.10	5.2	8 ft.	12,806,038	337	456	793
13	1-10	51.43	6.	Level.	12,392,940	324	443	767
14	1 10	51.43	4.5	"	12,806,038	339	426	765
15	1-10	51.43	4.	"	13,425,685	351	420	771
16	1-10	51.43	3.5	"	13,299,136	345	415	760
17	1-08	52.89	3.	"	13,838,783	371	443	814
18	1-08	52.89	5.	Down 6 ft.	13,219,136	354	464	818
19	1-08	52.89	3.	" 2 ft.	13,219,136	354	443	797
20	1-11	50.70	3.5	Up. 10 ft.	14,838,783	379	406	785
21	1-13	49.31	3.	" 10 ft.	14,458,430	362	384	746
22	1-08	52.89	3.1	Level. Down	12,392,940	332	443	775
23	1-07	53.70	3.1	10 ft.	12,186,391	333	462	797

MASTER CAR-BUILDERS' ASSOCIATION.

Discussions at the Annual Convention.

We present herewith a summary of the discussions on some of the reports presented at the recent annual convention of the Master Car-Builders' Association.

TRAIN BRAKES FOR FREIGHT CARS.

The report of the Committee on Train Brakes for Freight Cars (published in the *Railroad Gazette* of June 16, page 355) was taken up for discussion.

Mr. KIRBY called attention to the breaking of freight trains on grades, said that they often broke in two places, that the middle section was left without a brakeman, and that it was this section which did the mischief. He wished to know if any of the brakes discussed would prevent such accidents.

Mr. C. E. GAREY: With two exceptions, all the brakes mentioned in the report are operated by compression of the draw-bar, and when a train is broken in two a brakeman anywhere on the rear part of the train in applying the brake to the car where he is applies the brake by the same action to all the cars in the rear of that car. One exception is the Westinghouse brake, with which the Pennsylvania Railroad are not quite satisfied as to its practicability, and the other is the Stow brake, which has not been thoroughly tested as yet, although arrangements are made for testing it. I might add further that no brake that operates by compression, which is perfectly independent on every car to which it is applied, can be applied in the way suggested by Mr. Kirby without a concussion between cars, and if it is desirable to have the concussion between cars, all these brakes can be so applied.

ACCIDENTS TO TRAIN MEN.

The report of the committee on this subject (published in the *Railroad Gazette* of June 16, page 355) was taken up.

Mr. KIRBY: I have found that the distance between the double dead-wood blocks varies, as stated in my report, so that the single dead-wood ordinarily used would pass between them, and there would be no safety for the men. Therefore I think those who prefer the double dead-woods should bring them in, so that they and the single dead blocks would strike together, and perform the service for which they are intended, namely the saving of the trainmen.

Mr. DAVENPORT: Two views are held by car constructors on this dead block question. One is to take the blow on the intermediate, the other on the centre stringer. We see the double blocks of the Erie placed close together and those of the Pennsylvania far apart. It would be well for the convention to know the reason why those roads prefer those respective positions.

Mr. MILEHAM: Ours are placed 20 inches from centre to centre. They are so placed, because we think it is very much safer and very much easier for a man to reach that distance than if they were placed further apart; and it seems to me that they have fully as much strength—coming close to the two centre sills—as if spread apart.

Mr. KIRBY: I find that on the cars of one railroad company the blocks are 17 inches apart, 8 inches wide and 15 inches up and down. Now, with the blocks so placed, it is impossible for man to reach either over or under, to couple or uncouple. It keeps the man's hands away so that he can neither guide the link nor pull the pin. On the cars of another company, the blocks are 18 inches apart, and in size 8 × 12 inches. Another company has 30 inches between, 8 inches high and 8 inches face. Then there is another one 23 inches between and 9 inches face. The New York, Lake Erie & Western are in my judgment the nearest right. Their's are 8 × 10, and 12 inches between.

Mr. FORD: We can readily see that where a car having the double dead-block is coupled to a car having the single dead-block, the draw-bars have to take the brunt of the blow, especially on the car that has the single dead-block. If a car that has a double dead-block comes in contact with a car having the single dead-block, the dead-blocks can do no good until the draw-bar is driven under one of the cars, because where the single dead-block is applied to a car, the draw-bar must project enough to admit of the pin freely entering the link, and that necessitates some seven or eight inches, including the head of the draw-bar, beyond the dead-block; so that the double dead-block is not going to strike the single dead-block until that draw bar head is out of the way, because the draw bar in the case of the double dead block projects only about 2 inches, so that we have there nearly 8 inches, which have to be got out of the way somewhere before these blocks can strike. It is, then, essential when they are driven together in that way that the two should come together; that is, that the single dead-block should be long enough to strike both of the double dead-blocks. As has been said, with the way in which the dead-blocks are put on some of our cars, the single dead-block is so short that it will often pass between the two dead-blocks. So it is evidently a very essential point, that if we are to have the two kinds there should be uniformity in the distance, so that when they are forced together they will meet and protect the man who is between the cars. I believe it has been a necessity in the past with many of those cars that have the double dead-block, that they should be on the cars in order to protect the draw bars. We are talking about loading cars with 20 tons and putting them into long trains and increasing the speed. Yet little additional strength has been given to the draw bar rigging, and how are they going to stand such treatment unless they have some thing to protect them? For these reasons I believe that the double dead-blocks, with many of our cars are absolutely necessary as a protection to the cars. I am not prepared to say that they are so very much more dangerous to the men where the men are accustomed to using them.

Mr. FORNEY: This is a subject in which I have taken a great deal of interest for a long time, on account of the very large number of men who are killed and injured in the coupling of cars. The solution of it, however, is, in my opinion, attended with a good deal of difficulty. If you look at the equipment of the country and take the different lines, you will find that about one-half of the equipment is made with the single dead-block and the other half with the double dead-block. I therefore think that it is too late for this Association to take the position that they can induce either the people that have the single dead-block to abandon it for the double, or the people that have the double to take them off and put the single ones on. It strikes me that the only way out of the difficulty is for this Association to recommend a single dead-block of such length and double dead-blocks of such dimensions, that in case the cars come together, they will not interlock. That would leave the cars so as not to expose the men to any undue amount of danger, and it would leave the roads free to adopt the single or double block, as they saw proper. The matter is of very considerable interest to the railroad companies at this time, for the reason that it is attracting the attention of some of the state legislatures. The great mortality among the men has led people to clamor for some remedy to be applied. It therefore becomes of the utmost importance that this Association should recommend something effectual to diminish the danger to the men. If the Association does take any action which is really a remedy for the evil, the probabilities are that the legislatures will follow that action and enforce it by statute. It strikes me, therefore, that the action which the Association should take would be to recommend standards for both kinds, the single and double.

The PRESIDENT: The report of the Committee on Standard Draw Bar and Spring closes as follows: "We would therefore recommend that where double dead-blocks are used, they may be made of cast iron, 8 inches square on the face and 6 inches thick, and placed 24 inches apart, centre to centre, giving a clear space between them of 16 inches. This would allow a lap of 5 inches on each dead block on a 26-inch dead wood, and make it reasonably safe for trainmen to couple cars."

Mr. BISSELL: A very vital reason has been given for using the double blocks—the protection of the car and the protection of the draw-bar. But no real reason has been given for the use of the single block. Another point is that in adopting the two, as has been suggested, it would be nearly as much work to take off the single block as now used, and make it long enough to use with the double, as to adopt one and get the best one.

Mr. KIRBY: I will give my reasons for the use of the single block on the Lake Shore and Michigan Southern. The double dead-blocks were so far apart that it was impossible for the men to reach the pin and do the coupling; and so many men got maimed from getting their arms between those two dead woods that we abandoned the double dead woods for the single. But if they are brought together as the New York, Lake Erie & Western bring them, almost any of our single buffer-blocks will come against them. They are only about 12 inches between, I think.

Mr. MILEHAM: They are 20 inches from centre to centre; 12 inches clear.

Mr. KIRBY: We have increased the length of the trains and the carrying capacity of the cars, and yet we use a single draw-spring, the same as we did twenty-five years ago. My idea is to place two springs side by side, and cushion it more. If the single dead-wood is used, I advocate two springs being put there. I have got perhaps 100 cars on the road with those double-draught springs. They have been running now from three to four years. Not a single spring has been removed on account of being broken.

Mr. FORNEY: It seems to me that if we undertake to say absolutely which is the best, there is such a diversity of opinion, and there are such strong interests arrayed on each side, that it would be impossible to carry any one view. If you make the length of the single dead-block as long as the length over all of the double dead-block, you afford reasonable security for a man standing in there. If there is anybody who hankers after double dead-blocks, he can cut the single one out, and then he has a double one. I think that the whole thing hinges upon this, simply to establish an over-all length of the dead-blocks, whether single or double are used. There is still another point. It seems to me desirable that we should establish a height from the bottom of the draw-bar to the top of the rail. I have satisfied myself that there are from 1,200 to 1,500 railroad employees killed yearly in this country and 5,000 to 10,000 injured, and I would ask whether the mortality represented by those figures is not worthy of the serious attention of this body. But it is more important to do the right thing than to do it at once. I therefore think that if the committee report this standard to the different railroad companies, and ask them for an expression of opinion as to whether that is of the best dimensions, that we would be much more certain to reach a wise conclusion.

Mr. LEANDER GAREY (Mr. M. P. Ford, Vice-President, in the chair): With the present construction of draw-bar, the single buffer block unquestionably best protects the man while coupling; while the double buffer block unquestionably protects the car. Now, if there is a device by which both the men and the cars can be protected, that is what the railroad companies want; and I do not see why we cannot have the two combined in such a manner that they can be used together very successfully, and in the end gradually work into one system.

Mr. RAYMOND: I am heartily in favor of the single block, and I believe that unless an automatic coupler is adopted within the next few years, the railroad companies will have to discard the use of the double block by force of state legislation. There is no question in my mind that the safety of the men demands the use of the single block, and I do not think any body could make a very long or strong argument in favor of saving the car rather than saving life or limb.

Mr. ROWELL: The state legislatures, as has been suggested, are going to act on this question before very long. As soon as one acts, the others will act. If the first one that takes action upon it happens to adopt the double block, it will be followed all over the country, and we may have the system which is not the safest. If this Association adopts something on account of its safety, the first legislature that adopts any particular appliance for a dead-block will adopt the one which is recommended by this association, and what you do here will become confirmed by the state legislatures.

Mr. FORNEY agreed with Mr. Rowell in thinking it desirable that some definite action should be taken by the Association, provided the Association was quite sure it was prepared to take the right action. His own opinions had undergone considerable change quite lately. He had been surprised to find that a large proportion of the officers of the Pennsylvania Company's leased lines were in favor of the double dead-block as safer than the single. A mistake in the action of the convention would defeat the very object in view.

Mr. NELLS: I believe I am about the only one to represent the block which I use on the Virginia Midland road. It is a single block of cast-iron set immediately above the draw-head, and which I think pretty well covers both objections. It is about 10 inches across the face. It admits of the drawing of the pin even when the buffer is compressed. We set them about ¼ or ⅝ inches back of the draw-head, so that when the springs are drawn nearly together the dead-blocks receive the blow. In that case there is no danger of the arms of persons being caught between. You have the same access to the coupling as you would have if there were no dead-blocks on the cars at all, and at the same time they cannot be brought nearer together than 15 inches.

Mr. RAYMOND: One of the great difficulties with this double dead-block is this distance to reach over. It is the most dangerous element in it. Mr. Kirby in his report recommends 30 inches as the dimensions over all, but my judgment would be that 28 inches is the very maximum to which we ought to go.

The result of this discussion was, as stated in the *Railroad Gazette* of June 16, the adoption of the following section of the Committee's report: "We would therefore recommend that when double dead-blocks are used they may be made of cast-iron, 8 in. square on the face and 6 in. thick and placed 24 in. apart, centre to centre, giving a clear space between them of 16 in. This would allow a lap of 5 in. on each dead-block on the 26 in. dead-wood, and make it reasonably safe for trainmen to couple cars."

Mr. Raymond then moved the adoption of the following: "To reconcile the difference your Committee would recommend that those whose preference is for double dead-block shall make the over-all of the two blocks not more than 30 in., each block to be 10 in. long by 8 in. wide. Those who prefer the single dead-blocks must make them not less than 28 in. long, 7 in. thick, 8 in face. To hold the draw-bars in the present location, so as not to increase the length of train, cut the dead-wood out in the middle."

After considerable debate the motion was adopted.

The Clayton Air Compressors.

We give this week an illustration of the large duplex air compressors built by the Clayton Steam Pump Works, Brooklyn, N. Y., for use in sinking the caissons for the Northern Pacific Railroad bridge over the Missouri River at Bismarck, Dakota.

The manufacture of air compressing machinery promises soon to become an important industry of itself, for the day is not far distant when compressed air is likely to be used for many purposes to which steam is now applied. It is already in very extensive use for driving rock drills, coal-cutting machines, mine motors and underground pumping, sinking caissons, etc., and should the great tunnel now in progress under the Hudson River, between New York and

Jersey City, be completed under the system of employing compressed air (which in this case is furnished by three large Clayton duplex air compressors) a still more extended field for this class of machinery will open up in future tunneling enterprises.

Mr. James Clayton, of Brooklyn, N. Y., now builds a duplex air-compressor, shown in the accompanying illustration, which is said to overcome nearly all the obstacles heretofore experienced in maintaining a perfectly constant and high pressure of air. This machine, being built duplex, or with two steam and two air cylinders, can be run at a high rate of speed, and by cutting the steam off at half-stroke it does a much greater amount of work with the same amount of steam that would be required for a single machine, while at the same time the difficulty of starting the compressor and thereby the risk of injury to the machine is lessened, as it is started as slowly as circumstances may require.

In accordance with a well-known law, air is heated by being compressed, and this is the first obstacle to a successful air compressor. Mr. Clayton has overcome this by an ingenious arrangement of water-jackets around the air cylinders which receive the water on the top of the air cylinder, near the centre, and circulate it along the top, to and around the ends, one-fourth of their length, at which point the greatest compression of the air takes place, and the most heat is generated, and then passing around the centre of the cylinder escapes at the top, and thereby prevents the jackets ever becoming empty of water, as might happen if the discharge were on the bottom; while the temperature of the cylinders in the middle is equal in degree to the ends.

If all the air compressed by the pistons in traveling the length of the cylinders were not driven beyond the discharge valves, it would expand and follow the piston back, taking the place of fresh air and leaving only a portion of the space of the cylinders to be filled with new air for the next stroke. This is overcome by a contrivance driven from the crank shaft, which discharges into the air cylinders, at each stroke, a fixed volume of water or oil a little in excess of the cubical capacity of the clearance spaces at each end of the cylinders, which, while it lubricates the cylinders, is expelled at the end of the stroke, driving the air before it, through the discharge valves into the receiver, from which it may be again returned to the cylinders.

It has been found by applying the indicator to the air cylinders that the air had to raise to a pressure one-third higher than the receiver pressure before the discharge valves would open. This trouble is overcome by a simple mechanical tripping device, which lifts the discharge valves at that point in the stroke at which the air being compressed has reached the desired pressure.

All the valves are placed in the cylinder covers, and the seats, being screwed on, are easily removed for repairs if needed. The suction valves, opening inwards, are provided with safety stems, so that if a valve should break loose from its stem, it cannot fall into the cylinder and cause a general breakdown. Manila hemp is used to pack the air pistons, saturated with a compound which makes it semi-elastic and self-lubricating; or metal piston-packing is employed when preferred.

The patent air governor (seen on right of cut), used solely by the maker of these compressors, will maintain a constant pressure in the receiver, without reference to the number of drills, or other machinery using the compressed air, or the fluctuations of the steam pressure, automatically adjusting the speed of the compressor to the work to be done, and stopping it entirely when the air is not used, and starting it again when the pressure in the receiver begins to fall; all without any attention on the part of the engineer. It may be set to any desired pressure. The manufacturer claims that the "new duplex" will compare favorably with any compressor in the market in point of workmanship and construction. Connecting-rods, with a patent device for taking up the wear, are substituted for the sliding-journal boxes formerly used. The yokes are connected by a heavy wrought-iron rod on top, and a distance piece provided with shoes, on which it slides on the bottom. Stout piston-rods throw the weight of both pistons, yokes and connecting-rods on these shoes, so that the cylinders can never wear oval, or the cylinders or pistons cut.

The bed-plate is a single casting in the line of each compressor, and the steam and air cylinders, in addition to being rigidly bolted to it, are further tied together by a pair of strong iron rods on the top, so that no amount of hard usage will throw it out of line, and altogether they are exceedingly strong. We present three "indicator diagrams" taken from one of these compressors while at work. Cards Nos. 1 and 2 were taken from the air end of compressor, and card No. 3 from the steam end.

Card No. 1 was taken when the air cylinders were supplied with water for lubricating the interior surfaces and also filling the clearance spaces. Water was supplied the exterior jackets and the "tripping device" adjusted to act at the proper time in opening the delivery valves. The diagram shows that at the speed at which the compressor was working, the action of those parts which could directly influence the movement of the indicator was almost perfect. From the point at which induction ceased and compression commenced, the pencil followed the curve of constant temperature.

Card No. 2 was taken from the compressor without water in the jackets or in the cylinders, and with the discharge valves opening without the assistance of the toes. This shows a heavy loss of power through the air becoming heated consequent on its passage into a hot cylinder, a great loss in compressed air expanding back in the cylinders and occupying the space which should be filled by fresh air, and an immense waste of power in the power required to lift the valves, viz., from 45 lbs.—the working or receiver pressure—to 67 lbs., the pressure at which the valves lifted.

Card No. 3 was taken from the steam cylinders of a Clayton air-compressor, and shows the degree of economy attained to in its consumption of steam.

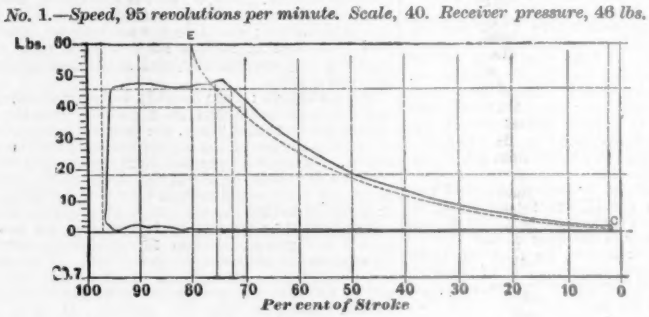
The compressor (with steam and air cylinders of equal diameter and stroke) was running at 90 revolutions per minute, with a boiler pressure of 70 lbs., cutting off steam at 52 per cent. of the stroke and giving an air receiver pressure of 100 lbs.

The larger size compressors, built with "independent cut-off valves on main-stem valves," show an increased economy in steam consumption.

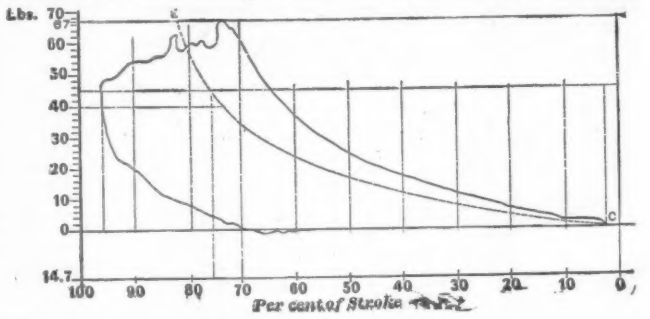
Mr. Clayton, the designer and manufacturer of these air-compressors (who is a brother of Mr. Thomas G. Clayton, the carriage and wagon superintendent of the Midland Railway, Derby, England) is thoroughly familiar with the construction and operation of mining machinery, having been for some years a resident of the Pacific slope and actively engaged in mining in Nevada County, Cal., where quartz mining was first commenced. Since that time, Mr. Clayton has devoted his time to the building and improving of steam pumping and air-compressing machinery.

Further information may be obtained by calling on or addressing the Clayton Steam Pump Works, Nos. 14 and 16 Water street, Brooklyn, N. Y.

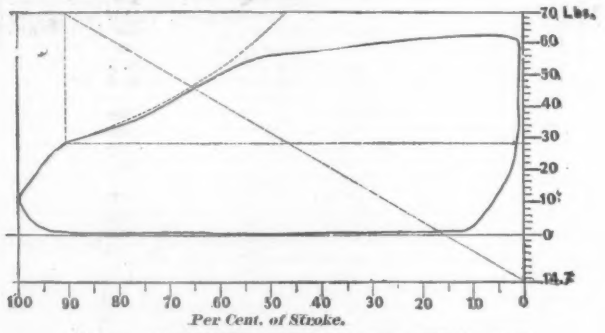
No. 1.—Speed, 95 revolutions per minute. Scale, 40. Receiver pressure, 46 lbs.



No. 2.—Speed, 53 revolutions per minute. Scale, 40. Receiver pressure, 45 lbs.



INDICATOR DIAGRAMS OF AIR END OF CLAYTON AIR COMPRESSOR.



NO. 3.—INDICATOR DIAGRAM OF STEAM END.

The Grand Trunk and Great Western Consolidation.

We give below the essential part of the deed or agreement of consolidation of the Grand Trunk and the Great Western companies, of Canada, which has now been ratified by the stockholders of both companies:

Whereas, under the powers conferred by an act of the Provincial Legislature of Canada, the directors of the Trunk Company have agreed with the directors of the Western Company that the companies they respectively represent shall be united as one company upon the terms and subject to the provisions hereinafter contained. Now these presents witness that each of them, the Trunk Company and the Western Company, pursuant to the powers conferred on them by the two last-mentioned acts of the 16th year of her Majesty, or otherwise howsoever, do hereby agree with the other of them, and do declare in manner following, that is to say:

1. On and after Aug. 12, 1882 (which day is in these presents called the date of union), the Trunk Company and the Western Company shall be and become united as one company and one corporation.

2. In accordance with the direction for this purpose contained in the before-mentioned act, the corporate name of the company (in these presents called the United Company), formed by the union of the Trunk Company and the Western Company, shall be, The Grand Trunk Railway Company of Canada.

* * * * * * * *

8. Any issue of share capital which could immediately before the date of union be made by the Trunk Company or the Western Company may from time to time be made by the United Company under the powers conferred by the acts relating to the Trunk Company or the Western Company, as the case may be, or otherwise, and having regard to the terms of these presents, and all increase of share capital so made shall be apportioned as follows, namely, 70 per cent. of such increase shall be apportioned and added to Grand Trunk share capital and 30 per cent. of such increase shall be apportioned and added to Great Western share capital, but such increase shall not be made so as to raise either the Trunk share capital or the Western share capital to an amount in excess of that to which each could have been raised if these presents had not been made. Provided that no powers shall be exercised by the united company to create and issue share capital in lieu of borrowing powers under the 11th section of the Great Western Railway Act, 1876, or as amended by the 5th section of the Great Western Railway Act, 1882, unless consent shall be given thereto by the vote of three-fourths of the holders of Great Western share capital, carrying a dividend at the rate of 3 per cent. as hereinafter mentioned, present in person or by proxy at any special general meeting of the holders of such share capital called for the purpose: but if such consent be given, 70 per cent. shall be apportioned and added to Grand Trunk share capital and 30 per cent. shall be apportioned and added to Great Western share capital.

9. The number of directors of the united company shall be fourteen.

10. The number of directors may at any time be increased or reduced by the shareholders in special general meeting.

11. One-third in number as near as may be of the directors of the United Company shall each be the holder of at least £2,000 of the Great Western share capital, carrying a dividend at the rate of 3 per cent., as hereinafter provided, and each of the other directors shall be the holder of at least £2,000 of the Grand Trunk share capital, and any director who ceases to be a holder of such capital of the company to that amount shall thereupon also cease to be a director of the United Company.

12. Names the first board of directors, and continues: In case of any vacancy prior to the first election, from death or resignation, it shall not be filled up so long as there shall be twelve. The first election of directors shall take place in the month of March, 1883, and the election of directors thereafter shall take place at meetings of the United Company, to be held in the month of March or April in each year, as the directors shall from time to time, by by-laws passed for that purpose, direct.

* * * * * * * *

14. Holders of Grand Trunk capital entitled to vote at meetings of the United Company mentioned shall have the same number of votes respectively as they have in the Trunk Company at the date of these presents. Holders of that portion of the Great Western share capital, carrying a dividend of at the rate of 3 per cent., as hereinafter provided, shall respectively have one vote for every £13 nominal of such capital held by them until £6,000,000 (including the amount already issued) of Grand Trunk debenture stock has been issued, and thereafter one vote for every £10 nominal of such Great Western share capital.

* * * * * * * *

22. The net earnings of the united undertaking shall mean the surplus of the earnings of that undertaking and of the

revenues of the United Company from all sources after discharging the working expenses thereof, and working expenses shall mean and include all expenses of maintenance and renewal of the railways and of the stations, buildings, ferries, works, and conveniences belonging thereto, and of the rolling and other stock and moveable plant used in the working thereof, and also interest on borrowed capital, and all such rents, percentages of receipts, interest guaranteed, or annual sums as may be paid in respect of railways, warehouses, wharves, or other property leased to or held by the Trunk Company or by the Western Company at the date of union or to or by the United Company thereafter, and also all moneys payable by way of rebate or otherwise under traffic or working arrangements between the Trunk Company, or the Western Company, or the United Company, and any other corporation or person, or in respect of the hire of engines, carriages, or wagons let to the separate companies before the union, or to the United Company sums payable in the adjustment of the pooling or division of traffics; rent-charges or interest on lands rented by or otherwise belonging to the United Company or purchased but not paid for, and also all expenses of and incident to working the railways and the traffic thereon, including stores and consumable articles, also rates, taxes, insurance and compensation for accidents or losses, also all salaries and wages of persons employed in and about the working of the railways, and traffic contributions to superannuation or other like funds, and all secretarial and establishment expenses, including directors' fees, salaries of commissioners, agency, legal and other like expenses, and generally all such charges (if any) and above otherwise specified (and no other) as in the case of English railway companies are usually carried to the debit of revenue as distinguished from capital account.

Provided, however, that nothing herein contained shall give to the proprietors, or mortgagees, or bondholders of any railway warehouse, wharf, or other property leased to or held by the separate companies at the date of union or leased to or held by the United Company, thereafter any further or other rights against the United Company, its property or earnings than they have under the lease mortgage bond agreement or guarantee upon which their rights are based; provided that money paid under a guarantee shall, if, and when repaid be applied as nearly as may be in the same manner as it would have been applied if no payment thereof under the guarantee had been made. Provided always that the sums equal to 20 per cent. of the traffic interchanged between the Wellington Grey & Bruce Railway and the Western Company as defined in the agreements between the Wellington Grey & Bruce Railway Company and the Western Company, which by the said agreement the Western Company became bound to apply in acquiring the mortgage bonds of the Wellington Grey & Bruce Railway Company shall on and from the date of union be applied by the united company as an investment by the United Company in the Wellington Grey & Bruce Railway Company's said bonds, to be reimbursed by re-sale of the bonds thus acquired, and that such sums are not to be charged upon the revenue or earnings of the United Company or any part thereof, but profit or loss on re-sale shall be credited to or charged against revenue, and a similar course shall be pursued in any other similar case, whether as regards the undertaking of the Trunk Company or the Western Company.

23. The net earnings of the united undertaking shall be divided between the two classes of share capital as follows, that is to say:

(a) Seventy per cent. of such net earnings shall be appropriated and belong to Grand Trunk share capital.

(b) The remaining 30 per cent. of such net earnings shall be appropriated and belong to Great Western share capital.

(c) But if in any year ending on the 31st day of December the 30 per cent. of net earnings appropriated to Great Western share capital should be insufficient to pay a dividend for that year at the rate of 5 per cent. per annum on the portion of that capital carrying a preference dividend at that rate, and also a dividend for that year at the rate of 3 per cent. per annum on the remaining portion of that capital, then the amount required to make up the full amount for that year of such dividends at 5 per cent. and 3 per cent. respectively shall be paid and made good out of the 70 per cent. of net earnings appropriated for that year to Grand Trunk share capital, but not out of the 70 per cent. of net earnings so appropriated for any subsequent year except that if the entire net earnings of any year shall be insufficient to pay the said dividend at 5 per cent. (which is and is to remain a cumulative dividend), the deficiency is to be a first charge payable out of net earnings in subsequent years.

(d) Nevertheless no higher dividend than such dividend at the rate of 3 per cent. shall in any year subsequent to a deficiency be paid on the portion of Great Western share capital carrying that rate of dividend, unless and until all sums which shall for the time being have been paid out of the 70 per cent. appropriated to Grand Trunk share capital for the purpose of making good deficiency of dividend on Great Western share capital shall have been repaid to Grand Trunk share capital out of the surplus (if any) of the 30 per cent. appropriated to Great Western share capital and remaining after discharging the dividends at 5 per cent, and 3 per cent. respectively on the several portions of that capital.

(e) The same principle as to division of net earnings shall be applied as nearly as can be to the portion of a year commencing on the date of union and ending on the 31st day of December, 1882.

(f) Out of items standing at credit in the books of the Western Company derived from revenues, including funds in reserve, the Western Company shall set apart and the United Company shall pay so much money as may be necessary to pay the preference dividend at the rate of 5 per cent. per annum to the date of union upon so much of the Western Company's share capital as carries that rate of dividend.

(g) Provided however that when and so often as there shall be any deficiency in the said 3 per cent. dividend owing to the insufficiency of the said 30 per cent. appropriated to Great Western share capital as aforesaid in any year, to provide the same for such year the United Company shall be entitled to apply and shall apply so much as may be necessary to make good such deficiency out of the amount which may stand from time to time to the credit of the present reserve funds of the Western Company, which are to be kept in reserve by the United Company as an additional security for the regular payment of such 3 per cent. dividends, and as a protection to the said 70 per cent. appropriated to Grand Trunk share capital as aforesaid against its obligation aforesaid to make good any such deficiency, but the United Company shall not be bound to set aside any particular investment or funds to represent the said reserve funds.

(h) If for any half year ending on the 30th day of June a dividend has been paid to any class of stock or share capital, which, on making up the accounts for the year ending on the 31st day of December following, it is found that that class of stock or share capital is not entitled to receive, then the excess shall be adjusted and repaid in the accounts of that 31st day of December, if the same can be done, and if not, then in the accounts of the following or any subsequent year.

24. Subject as in this agreement, provided the 70 per cent. of net earnings of the united undertaking appropriated to Grand Trunk share capital, shall be paid and applied to the persons and in the manner to whom and in which the net earnings of the undertaking of the Trunk Company would have been payable or applicable if these presents had not been made.

25. The 30 per cent. of net earnings of the united undertaking appropriated to Great Western share capital together with any sums paid out of the Great Western reserved fund, and out of the 70 per cent. appropriated to Grand Trunk share capital to make up deficiency in dividened as in Clause 23 provided; shall be paid and applied to the persons, and in the manner to whom and in which the net earnings of the undertaking of the Western Company would have been payable or applicable if these presents had not been made.

* * * * * *

27. The directors of the United Company shall wind up the affairs of the Trunk Company and the Western Company to the date of union, and finally balance the books of those two companies to that date, and all moneys due or standing to the credit of each of those two companies on the date of union shall be paid and applied by the directors of the United Company for the purpose and in the manner to which they would have been payable or applicable if these presents had not been made.

28. All the officers and servants of the Trunk Company and the Western Company shall on and after the date of union become the officers and servants of the United Company at the salaries or wages, and upon the terms at and upon which they were previously employed by the Trunk Company or the Western Company as the case may be.

* * * * * *

The remaining sections provide that the agreement shall be void if not ratified before Aug. 12, by both companies (it has been so ratified), and for the preservation of duplicate copies and filing the original with the Secretary of State of the Dominion of Canada.

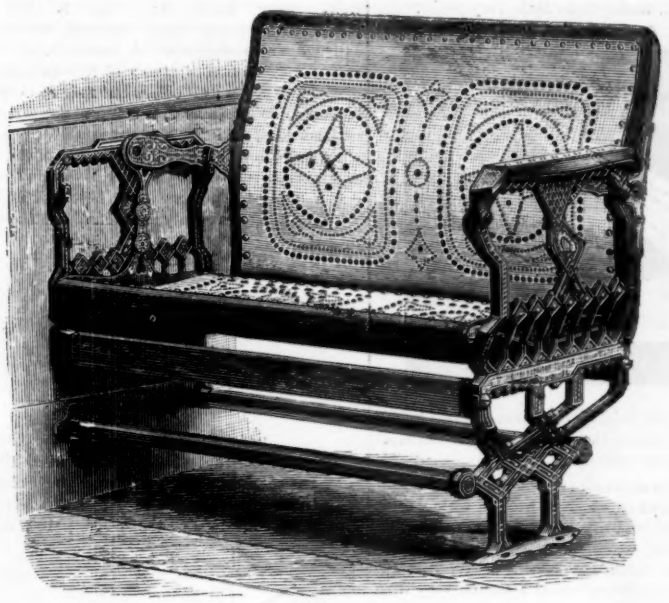


Fig. 1.

GARDNER'S REVERSIBLE CAR-SEAT.

Gardner's Reversible Car Seat.

The engravings (figs. 1 and 2) illustrate a very ingenious method of constructing car seats, with reversible backs, so that the seat will be inclined backward in either position. Fig. 1 is a perspective view of the seat, and fig. 2 shows one of the seat-ends with part of the seat-back arm removed. The latter is attached to the spindle *A*, which has a segment of a toothed gear on it. This gears into a kind of rack *c* on the upper end of the inverted ⊥ piece *c e*, which is pivoted at *e* and supports the seat. It is obvious that when the seat-back arm *f* is turned over, that the segmental pinion *A* will make a half revolution, and through the action of the gearing, will move the upper end *c* of the ⊥ piece towards the left, and thus when the back is reversed, will incline the seat the opposite way from that shown in the engraving. Attention has frequently been called to the fact of the comfort which results from the backward inclination of a seat, a fact which was well understood by the makers of the old stage coaches; but when reversible seats were introduced into cars, this old commendable practice was abandoned, owing to what was then considered the insuperable difficulty of changing the inclination of the seats with the position of the backs. This is overcome by the device illustrated, which has been patented by Mr. Gardner, of the firm of Gardner & Co., whose address is No. 183 Canal street, New York, and who are the manufacturers of this improved seat.

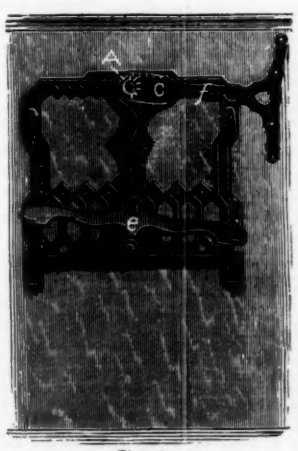


Fig. 2.

Transportation in Congress.

In the Senate on the 6th: The House bills to authorize the Washington & Atlantic and the Washington City & Point Lookout railroad companies to extend railroads into and within the District of Columbia were reported adversely and indefinitely postponed.

The Committee on Commerce, in reporting the River and Harbor appropriation bill, stated that they had inserted a provision authorizing the Secretary of War to lay out and construct a canal from a point on the Illinois River, at or near the town of Hennepin, to the Mississippi River, at or above Rock Island, and had appropriated $100,000 for the work.

The bill was then read and the amendments of the Committee concurred in as reached.

Upon the question of the Hennepin Canal Mr. McMillan stated, in reply to inquiries, that the canal would be maintained at government cost free of tolls. The statement provoked considerable discussion and some opposition to the project. Finally Mr. Butler gave notice of a proposed modification of the committee amendment, and without action on the subject the Senate went into executive session.

In the House on the 6th:

The Senate bill was passed authorizing the New Orleans & Northeastern Railroad Company to construct bridges across the channels of Pearl River and Lake Pontchartrain.

In the Senate on the 8th:

The River and Harbor bill was taken up, and the Hennepin Canal project further discussed, the question being upon Mr. Butler's amendment providing for an additional survey and report upon the cost of construction, annual maintenance and use of the canal.

The Committee amendment, as modified, was adopted.

In the Senate on the 10th:

Mr. Dawes called up the Senate bill granting the right of way to the Arizona Southern Railroad Company through the Papago Indian reservation in Arizona. Passed.

The River and Harbor Bill being again under consideration, Mr. Harrison, from the Committee on Transportation Routes to the Seaboard, offered an amendment authorizing the expenditure under the direction of the Secretary of War of $20,000, or so much thereof as may be necessary in completing the surveys of a ship canal to connect the Chesapeake and Delaware bays, and directing a report to Congress as to which of the various routes surveyed will afford the greatest protection in case of war, and most effectively cheapen the cost of transportation from Baltimore to the Atlantic ocean, together with the cost of the improvement and its approaches, and the annual cost of maintaining and operating the canal when completed. Adopted on a *viva voce* vote.

Mr. Morgan said he would demand a separate vote upon the amendment when the bill was reported to the Senate.

Mr. Plumb, from the Committee on Public Lands, reported a bill repealing all laws granting lands to the state of Missouri to aid in the construction and extension of the Iron Mountain Railroad in that state, and to restore such land to the public domain. Placed on the calendar.

Contributions.

Papers on Painting.—No. 12.

BY CHARLES L. CONDIT.

[*Copyright*, 1882, *by The Railroad Gazette.*]

COLOR AND HEAT.

A color, properly speaking, is a color; that is to say, it is not a pigment, it is not a substance, it does not belong to any *thing*, it belongs to the mind which sees the thing. This is the fact behind the word. Let it be supposed, however, that common meaning is the true one, namely, that color is some *thing* belonging to a *thing;* what color is white lead in the dark? We may reply it is to us of no color, because we cannot see it, but that it will be seen to be white so soon as a light is brought into the room. If we bring a pure red light, however, the white lead will not be white but red; if a pure blue light, it will be blue. In this case we say that the light colors the white lead; and we must also say, that the pure white light makes the white lead white; and therefore, if

no light be in the room, the white lead is of no color, because it is colored by whatever light falls upon it.

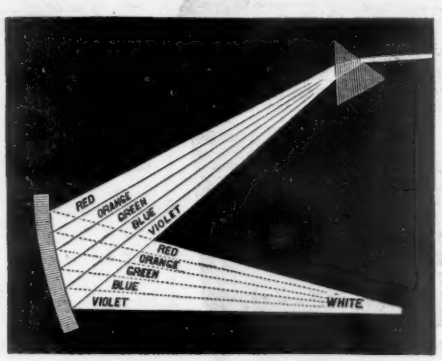
Color, therefore, is not part of the thing, but of the light falling upon the thing. Let this conclusion be in the form of a question to be answered; for it may be that color is no more a part of the light than it is part of the thing.

"If we place a solution of bichromate of potash (yellow) and a solution of litmus (blue) one behind the other, and look through both at a white surface behind them, this surface will appear yellow and not green, as we are led to expect. If now we investigate the light by aid of a prism, we shall find that it contains *no yellow* at all, but only red and green."*

Two substances, the one yellow and the other blue, give a red and a green light which to our eyes is yellow, although it contains no yellow light whatever. Surely color is an uncertain thing, *except as we see it.* The color-blind man who purchased scarlet cloth to make a green hunting-jacket was hardly in a more confused condition than are we, unless we accept the fact that color is a result in our minds.

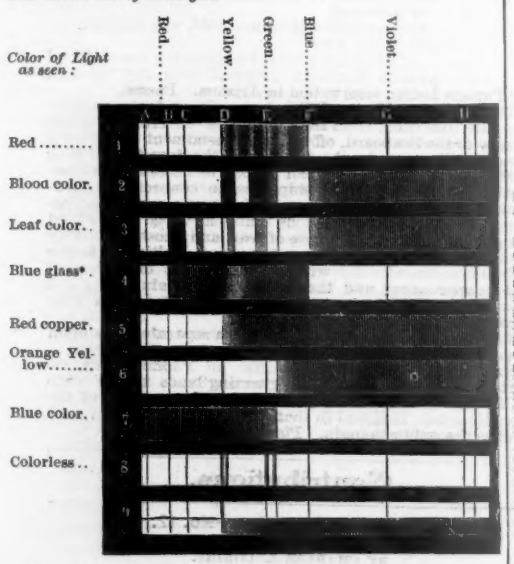
Colors and Pigments.—The painter needs to get these apart for in many a painter's mind they have grown together.

Light contains many colors, that is to say, when we separate sunlight we find a great variety of colors in it. Sunlight is separated by a glass prism and may again be brought together into one white light by throwing the separated light upon a plate of properly bent looking glass. The accompanying illustration† makes these facts very plain:



Artists and painters who neglect the colors shown by the prism (price 50 cents) neglect the purest, softest and most beautiful of all displays of coloring.

It is not only possible to separate the colors of white sunlight, but also of all colored substances through which light can be forced in sufficient quantity. The following are the spectra, *i. e.*, the separated colors—of substances which appear to our eyes in colors written at the side of the illustration. Sunlight makes a spectrum which is full of very fine lines, and by these the beginning and ending of each color may be noted. The places of the colors are written above the spectrum, so that the amount and the kind of each color (the light surfaces are color) may be seen. The darker surfaces in each spectrum *show the colors which the substance has taken out of sunlight.*



Separated Colors of Light coming through Substances‡.

"B" and "C" are in the red; at "D" yellow begins; at "E" green, and at "F" blue; "G" and "H" violet color.

The shaded portions, represent colors which have been absorbed, the light portions, those colors near the lines to which names are given above the cut; the total of the light portion makes up the color written at the side.

It will be observed that a red-colored light may contain also much material for making to our eyes violet and blue light. Blood (2), which is red, has also some green and yellow in it; but much of the green and nearly all of the blue and violet are swallowed, and not allowed to pass through.

* Von Bezold. "Theory of Color." L. Prang & Co.
† By permission of D. Appleton & Co., from "Modern Chromatics," by Prof. Ogden Rood.
‡ Spectrum of substances as follows: (1) per manganate of potash solution; (2) blood; (3) chlorophyll; (4) cobalt glass; (5) red oxide of copper glass; (6) bichromate of potash solution; (8) oxide of didmyum glass.

Leaf color* (the green coloring matter of plants) allows some of the red to pass through it, and also swallows some of the green. Green leaves are also red, as may be observed by looking at them through two blue glasses and one red glass. Grass is redder than a red brick. Place the brick on the grass plot and examine it through the above-mentioned glasses.

Blue glass (4), it will be seen, shuts out green rays, and allows some of the red rays as well as all the violet rays to pass through it. A red glass, however, is necessary to add to the green, because it shuts out the blue rays passing through the blue glasses. No. 5, red copper, it will be observed, shuts out the blue rays as well as the green ones.

An orange-yellow color (6), allows all the red, yellow and green rays to pass through, and the result to our eyes is the color we see.

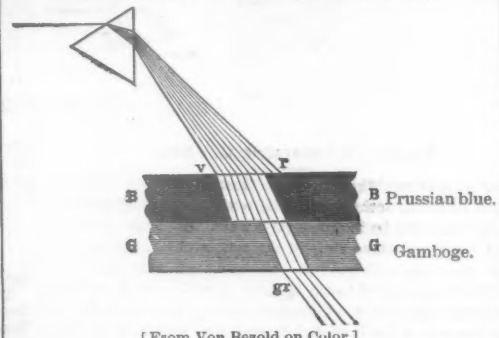
No. 7 is a blue color, but differs very much from the blue cobalt glass of No. 4, in that it shuts out all the red rays. The colorless glass of No. 8, it will be observed, is still dark at certain portions, but it allows nearly all the colors to pass through it, which make up a pure white light. No. 9 shows that the glass does *not color the light.* The upper portion of screen No. 9 is white, the lower division red; the white reflects each color, the red surface swallows all the colors but the red, seen as white space at the left. It is by swallowing other colors than those seen that substances produce color—that is to say, colors are produced by taking some of the sum of colors in white light away from it; what is left we know as color. Thus when bright sunlight, which is white light, falls upon a substance which swallows all colors but blue, then the substance is blue; if it swallows all colors but green, it is green; all colors but red, red. If the color can be said to be *anywhere*, it is in the light, and by the name of that kind of light not swallowed by a substance, we name the color of the substance. In other words, a blue substance is one which takes up, swalllows other colors, but does not take up nor swallow blue. The thing does not color the light, but only uncolors, destroys certain lights thus :†

White light.

Blue.

Red.
Green.

Above the surface, the light is white, the light on and from the surface is blue, because the other lights (which with blue made the white light) are left below the surface in the substance of the wood paint, or whatever the



[From Von Bezold on Color.]

The Prussian blue takes out red and yellow rays, allowing the blue to pass through to the gamboge. Gamboge takes out the blue rays; only the green rays are left, therefore the gamboge will appear green if mixed with Prussian blue, while a true blue and a true yellow would appear gray.

* Let us take the white lily. If the petal of the flower had been merely a sheet of thin glass, you would not have seen that white color. There would have been a little light reflected from the first surface and the back surface, but the petal is really composed of a vast assemblage of little cells, at each of which partial reflection takes place, so that it resembles some finely-powdered glass, which would form a white powder, because each little surface is capable of reflecting the light, although a single sheet of glass would not be white. The petal of the white lily is just in the condition of the powder. It is full of little cells, full, optically speaking, of irregularities, from each of which a portion of light is reflected, so that, all kinds being reflected alike, and there being nothing in the white lily to cause preferential selection of one over the other—nothing to sift the light, as it were—you get a considerable quantity of light reflected back to the eye, but it is white. What is the difference between that and the red poppy? The red poppy is, as it were, a white lily infused with a red fluid; there is light continually reflected backwards and forwards, just as before, at the surface of the cells; but that light, in going and coming, passes through the colored juice of the plant. It is the same thing with a green leaf. The structure is irregular, optically considered; there are constantly reflections, backwards and forwards, of light, which penetrates a little depth and is reflected, and has to pass through a certain stratum of this coloring matter, to which the name chlorophyll has been given, but which is really a mixture. That is what takes place generally as regards the coloration of bodies; it is a phenomenon not of reflection, not of selection of one kind of light for more copious reflection than another, but of absorption, or the swallowing up of certain kinds of light. Reflection comes in, in order to enable us to see the light which otherwise would not enter the eye at all, but would go off in another direction. PROF. STOKES.

† For both form and color perception the eye is most perfect in the centre, from here outwards becoming more and more defective. Look carefully with one eye at a word as long as "constitution" on an ordinary printed page, and it will be seen that in reality only the first three letters are distinct. The muscles of the eyeball turn it so easily along the line that we hardly notice that it is only the centre of the retina which accurately perceives. Now the same is true of the sense of color, which is also best at the yellow spot, as it is called, in the centre of the retina. Look steadily forward with one eye while the other is shut, and at the same time move a small bright-colored object, as a red wafer, gradually from the centre of the field of vision outwards. One will be surprised to find how soon it loses its color and appears black, whilst its outline can still be dimly perceived. There is a central zone in which we see the three primary colors—red, green and violet—around this another, in which only two, green and violet, are seen; and outside of this, the rest of the retina perceives only violet or blue. This, at least, holds true under ordinary illumination. For simplicity we call this violet *blue.*
DR. B. JOY JEFFRIES.

colored thing is. Black keeps nearly all of all kinds of light; therefore it is black. White does not keep any kind of light, especially, although it does swallow a portion of every kind of light which falls upon it.

Let us suppose, however, that white lead swallows none of the light which falls upon it; then we may call it perfect, or 100, and other pigments* will be in the following parts of perfection, or of 100.

	Luminosity.
White paper	100
Pale chrome yellow	80.3
Pale emerald green	48.6
Cobalt blue	35.4
Vermilion (English)	25.7
Ultra marine	7.6
Black	5.0

It will be seen, therefore, that the amount of light destroyed or swallowed by different substances varies somewhat with its color; and this, as we shall see, has a practical aspect of much interest and even importance to the painter. Very much has been written about the relation of the color of cars to the durability of the paint and especially of the varnish. The writer did not desire to add more *words* on such a subject. Unable to find any facts, or satisfaction, no course was open but that of experiment. These experiments, too, have only been begun, rather than fully completed; but for this very reason he desires to interest his readers in them.

Benjamin Franklin (honor to his memory) among his other common-sense experiments placed cloths of various colors on a snow-bank, and noted the fact that the snow under the darker colored stuffs melted much more rapidly than that under those of lighter colors. Since that time various experiments have been made on the relation of color to *heat;* the latest being those of Mr. Tyndall. No experiments within the writer's knowledge, or generally known even to those of exact scientific knowledge, have been made as to the heat relations of color to direct sunlight. A writer in *The Coach Painter* expresses the opinions of many when he says: "It is true, however, that rays of light are, to a certain extent, transformed into heat when striking a body; but by reason of their paucity, and because deficient in energy (*i. e.*, force) this item may be disregarded." In other words, because it has been shown that colors are much alike as *colors* in relation to heat, therefore their difference in relation to light will make little difference in whatever light they may change into heat.

This opinion would be sustained by some, perhaps many scientific men. It may be a true statement, but it is very wrong somewhere, either in what it assumes or in what it infers. I may be mistaken, but color stands in such relations to sunlight that I am quite willing to suggest that it is a subject on which no one can as yet do otherwise than stand by whatever facts may exist. The method of experiment adopted was as follows: Flasks of thin glass, carefully measured so that a certain line marked their contents as 100 cubic centimetres of water at a given temperature were painted with various colors, some of which were varnished. Other smaller flasks less accurately measured, but sufficiently exact, were prepared in like manner, in order to give that variety which is necessary to any trustworthiness in experimental work. The flasks were filled with water to the given line; the painted and varnished surface extending likewise to the line. They were then exposed on a board having a back which served as a reflector. Every preparation was made to give the margin of error to darker colors.

EXPERIMENTS.

Warm day of early April. Water of same temperature placed in both flasks:

	First examination.	Second examination.
White lead	74°	85°
Iron paint	85°	410°

Cold but bright day in April; thermometer in the sun as stated:

	First examination.	Second examination.
Thermometer	38°	47°
White lead	50°	60°
Iron paint	62°	72°
Yellow schre	58°	67°

One coat of varnish over each color:

	First day.	Second day.
White lead	66°	60°
Iron paint	77°	70°
Yellow ochre	74°	65°

Three coats of varnish over each color:

	First examination.	Second examination.
White lead	64°	88°
Iron paint	72°	100°
Yellow ochre	66°	97°

The following facts may be noted: Only the direct sunlight effects a difference in temperature. A cloudy but very bright day gives very little or none; and so soon as a cloud covers the sun the temperature falls to equality.

A bright May day:

	Temperature of bottles.	After an hour in the sun.	Rise.
The red lead	65	92	27
Paris green	65	100	35
Two coats of varnish over:			
Pullman color	62	104	42
Chrome yellow	62	88	26
The same on a warmer day, after several hours:			
Pullman color	62	116	54
Chrome yellow	62	103	41
Colors mixed with varnish:			
Red lead	62	102	40
Paris green	62	113	51
To show the little influence of kind of surface:			
A very bad surface of chrome yellow over a very hot green color			102
A newly varnished Paris green			115
White lead			99

It will be observed that one hour in the sun increases the difference of heat between the colors to a point which does

* Rood's Chromatics.

not seem to be surpassed afterward. That is to say, the water in two differently colored bottles shows a difference of ten degrees in one hour; it does not show more than 15 degrees at any time. This, however, is partly an accident. The increase of heat in the bottles takes place only while the sun is shining directly upon them. As soon as a slight cloud covers the sun the heat begins to disappear; and on a very bright but obscured day, little difference will be found in the bottles.

There is, however, another reason, of which, from the defective method used (bottles of *water*), I am unable to give the true value. It is evident that the rise in temperature is self-limiting. As the heat accumulates in the hotter bottles, the rate of loss of heat increases. This will be evident, from an experiment given at the close of the article.

Whenever a cloud covers the sun, the bottles begin to lose heat: those covered with the warmest colors losing heat (as they gain heat) most rapidly.

Two coats of varnish over:

	In the sun.	Out of the sun.
Pullman color	110	94
Chrome yellow	100	90

Unless the day is cloudless, therefore, the bottles of various colors tend to approach each other, because of the greater loss of heat from the warmer color at every obscuration of the sun.

This is an important fact, for it must affect to some degree the question of the cracking of varnish or paint: a color which is gaining and losing heat every few moments is putting the varnish constantly to the test. As to what the temperatures of the immediate surface are I do not know; it would be a very difficult matter to ascertain correctly. On a hot, cloudless day of July, however, it is possible some definite results might be ascertained.*

The kind of surface, bright or broken or dull, makes less difference in the amount of heat proscribed than one would suppose to be the case. I am inclined to believe with those scientific men who have attributed some of the difference between the heat of colors to the change of light into heat; that the rays kept by the substance becoming heat to the substance.

However this may be, in the matter of painting roofs, refrigerator cars, and perhaps also passenger cars, the following facts are important. They may also have a bearing on the painting of bridges, as some of our foremost engineers, bearing the heaviest responsibility, make it a rule to avoid all unnecessary expansion of the iron by the use of light colors:

Four bottles of water, each containing to a certain line 100 cubic centimetres; two smaller bottles of water, of uniform capacity. All have corks. They were long since painted, and are placed in the sun on a warm, clear day, the first set at 7:30 a. m., and the others as indicated:

	Pullman color, twice varnished.	Chrome yellow, twice varnished.	Red lead.	Paris green.	White lead.	Paris green.
	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.
First examination	69	69	.....	.....	69	69
Later	105	94	69	.....	90	104
"	112	100	96	72	96	111
"	118	107	105	105	103	118
"	125	112	112	115	107	125

10.40.—At this hour the sun was less bright and temperature of hotter bottles fell.

In cooling, the hotter bottles cool most rapidly; it is difficult to say whether color has an effect in rapidity of cooling, but it apparently has.

The above experiments agree with those incidentally made by an English engineer in India, who doubted whether any advantage was gained by the great thickness of house-walls, which the natives thought necessary to keep out the heat. To test the matter, he built two experimental houses, closed them entirely, and observed the temperature of the air. There was a difference of about 5 degrees in the temperature of the two interiors, which he attributed to the fact that one was plastered with dark mud, the other with white lime. After both had been whitewashed, their temperatures became uniform; hottest just before dawn, coolest at midday. In other words, the thickness of wall simply changed the times of the interior temperatures, giving them at night the heat of the previous noonday. It required about one day (as was proved when a permanent change of temperature occurred) for the outside temperature to affect the interior of the house.

1. White is the coolest color, and all colors are cool (practically) in that proportion in which they *reflect* light.

2. Green is perhaps the hottest of bright colors, but as it swallows more or less of other rays. (Blue is so little used, we have disregarded it.)

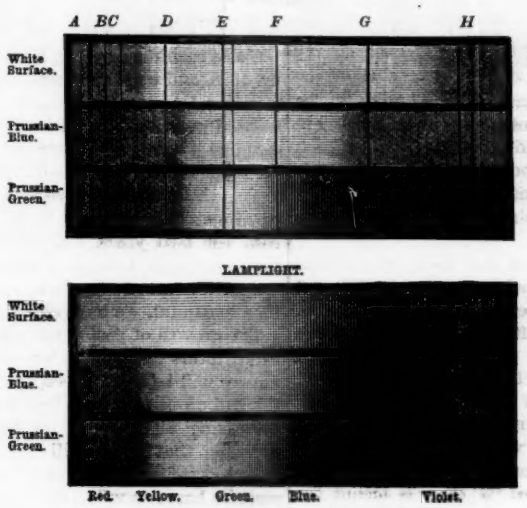
3. Neutral tints are perhaps next to white lead in coolness, and also are the most comfortable of the cool colors to the eye on a bright day.

4. Yellow is a cool color, the coolest of bright colors, but in proportion as it reflects light. It is nearly as cool, or even cooler, than many neutral tints.

5. Red is next to yellow in coolness as a bright color, but in proportion as it reflects light.

6. There is less difference as to final result of accumulated heat than one would suppose from the difference in the heat production of the several colors, partly because so very few days or hours are absolutely cloudless.

Fig. 10.



[From Von Bezold on Color. L. Prang & Co.]

CONCLUSIONS.

(1.) Light only has color in any sense. The kind of light *not* kept by a substance is what we call the color of a substance.*

Color is the expression of feeling in nature to us, it is a natural language to our feelings. In the pleasant light of morning, in the faces of many flowers, oftenest perhaps at sunset, color is to us all the language of an unspoken benediction. Light is the messenger of color—but the benediction can be read only by the unseen eye of feeling.

(3). Substances absorb (keep) certain rays of light and heat; those which keep the most are hottest.

(4). Painters should study color. Taste and not scientific rules must be one's guide to good coloring, and good taste comes by the study of good coloring of the best masters of color, and of the coloring in Nature.

* I have been unable to get satisfactory results with the temperature of the immediate surface. Two pieces of iron—one painted dark red, and so hot as not to permit the hand to rest upon it; another painted drab, and to the touch many degrees cooler, gave little difference in temperature on the application of a round bulb thermometer.

*Metals may have two colors, one by reflected light, the other by light passing through them. Gold is green or blue, water is blue, a white lily is colorless, some aniline colors are green or red as you look at or through them.

THE SCRAP HEAP.

The Tables Turned.

"Is this seat engaged?" he asked of the prettiest girl in the car, and, finding it wasn't he put his sample-box in the rack and braced himself for solid enjoyment. "Pleasant day," said the girl, coming for him before he could get his tongue unhinged. "Most bewildering day, isn't it?" "Ye-yes, miss," stammered the drummer. He was in the habit of player pitcher in this kind of a match, and the position of catcher didn't fit him as tight as his pantaloons. "Nice weather for traveling," continued the girl; "much nicer than when it was cold. Are you perfectly comfortable? "Oh, yes; thanks!" murmured the drummer. "Glad of it," resumed the girl cheerfully. "You don't look so. Let me put my shawl under your head, won't you? Hadn't you rather sit next to the window and have me describe the landscape to you?" "No, please," he muttered; "I—I'm doing well enough." "Can't I buy you some peanuts, or a book? Let me do something to make the trip happy! Suppose I slip my arm around your waist! Just lean forward a trifle so I can!" "You'll—you'll have to excuse me!" gasped the wretched drummer; "I—I don't think you really mean it!" "You look so tired," she pleaded; "wouldn't you like to rest your head on my shoulder? No one will notice. Just lay your head right down, and I'll tell you stories." "No—no, thanks! I won't to-day! I'm very comfortable, thank you!" and the poor drummer looked around helplessly. "Your scarf-pin is coming out. Let me fix it. There!" and she arranged it deftly; "at the next station I'll get you a cup of tea, and when we arrive at our destination you'll let me call on you?" and she smiled an anxious prayer right up into his pallid countenance. "I think I'll go away and smoke," said the drummer, and hauling down his gripsack, he made for the door, knee deep in the grins showered around him by his fellow passengers. "Strange!" murmured the girl to the lady in front of her. "I only did with him just what he was making ready to do with me, and big and strong as he is he couldn't stand it. I really think women have stronger stomachs than men, and, besides, there isn't any smoking car for them to fly to for refuge. I don't understand this thing." But she settled back contentedly all the same; and at a convention of drummers, held in the smoker that morning, it was unanimously resolved that her seat was engaged, so far as they were concerned, for the balance of the season.—*Chicago Times*.

Production of Coal and Iron in the German Empire in 1881.

The Association of German Iron-Masters and Steel Manufacturers has recently issued, six months previous to the usual official statistics, a series of figures relating to the production of coal and the manufacture of iron and steel in the German empire. The returns are not quite complete, and a column is therefore added showing the production during the preceding year of the works where figures have not yet been sent in. As will be noted, these are small only, and the data are sufficiently close for all practical purposes.

All the figures are given in metric tons.

	1881.	1882.	Missing returns.
Coal	48,697,784	46,972,202	1,304
Iron ore	7,553,658	7,218,040	20,601
Foundry pig	242,153	208,440	2,987
Bessemer and other pig for steel manufacture	858,908	716,328	15,210
Forge and mill pig	1,633,820	1,639,139	93,612
Direct castings	33,256	34,603	2,272
Other grades	15,900	15,285	1,163
Total pig-iron	2,784,037	2,613,795	115,244
Charcoal pig	41,710	40,914	4,406
Coal and coke pig	2,734,047	2,568,299	110,838
Mixed fuel pig	8,280	4,582	.....
Foundry castings	524,209	479,127	35,720
Rolled iron	1,224,245	1,143,281	124,016
Steel blooms sold as such	45,194	28,406	.....
Crucible steel	7,406	6,669	1,099
Bessemer steel	812,877	599,072	25,345

It will be noted that there is a considerable increase in almost all the items, even leaving out of consideration the missing returns.—*Engineering and Mining Journal.*

The Other Side of the Question.

The funny men of the American press seem never to tire of the foibles of railroad men. They take a peculiar delight in recounting the extreme urbanity of brakemen, gatemen and all other officials of the rails when questioned regarding the movement of trains or other matters concerning the working of the line in which the passengers interest themselves. But they do not often call the attention of their readers to the extreme good sense shown by the traveling public in asking questions.

Here is a great field unworked. Could one of these geniuses (the funny men) but know of the questions put to railroad officials there would be a revolution in at least one branch of newspaper humor.

If any reader has a doubt of this, let him or her take up a station by the side of one of the gate-keepers of the New York Central depot in this city for an hour in the morning or afternoon at about the time all the trains are arriving and departing.

To be sure some of the questions are of no consequence, but they are put evidently for the commendable purpose of keeping the official busy and out of mischief, for "Satan still finds," etc. For instance, when told that such a train was reported on time this morning, a woman with blonde bang and a superabundance of fat asked three times, and in three different ways, of one of the gatemen if the report was correct. The woman knew that she already had all the information in possession of the gateman, but she—very properly—could not bear to see him idle. And he enjoyed telling her as many times as she could ask, as a matter of course.

A reporter who was present kept his eye on that woman and by actual count he saw her approach seven different railway officials and heard her put the same question eleven times. This case could be made much of by a first-class funny man.

Another peculiarity of those who travel is also unworked, and should not longer be neglected, and that is the persistence with which many of them attempt to take their own lives by throwing themselves under the wheels of approaching locomotives. No one who does not make a study of the matter daily has any idea how many would-be suicides there are among the American traveling public. Depot-master Smith, Policeman Stott, the conductors, the baggage smashers and the brakemen are busy all the time saving lives.

And while we are considering this subject it might be a good idea to inquire why it is that no provisions are made by the government to award medals to railroad officials who save life, as well as to members of life-saving crews who rescue shipwrecked people. The annual number saved by the railroad men certainly out-aggregates the number saved from the sad sea waves by many thousands.

Let our funny men and the honorable, the representatives of the people in Congress, consider these matters well, and ponder them carefully, and we shall have a great revolution in certain matters in America.—*Rochester (N. Y.) Post-Express.*

A Powerful Dredge-Boat.

A new screw dredger of 800 tons, built and engined by Messrs. W. Simons & Co., was recently launched, complete, from their works at Renfrew, Scotland. It is named "Clyde," and is the property of the Clyde Lighthouse Trust, having been built under the direction of their engineers, Messrs. D. & T. Stevenson, Edinburgh. This is the third dredger this firm have constructed for the River Clyde, and will be the most powerful, being fitted with compound engines of 350 horse-power, and it is designed to raise 500 tons per hour from a depth of 35 to 40 feet of water. On board are steam appliances for head, stern and side movements; also for lifting, lowering and manœuvering; and throughout the hull and machinery every recent improvement has been adopted.

An Electric Railroad.

Mr. Edison has now a narrow-gauge road laid for about two miles from his laboratory at Menlo Park, N. J., on which he frequently runs trains consisting of an electric locomotive and a passenger car. The track is not very smooth, and there are some heavy grades on the road, but the performance of the engine is said to be very good.

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UNITED STATES RAILROADS IN 1881.

We publish on another page a portion of the introduction of Poor's Manual for 1882 (issued this week), and the table in that publication which shows the mileage, equipment, capital, earnings, expenses, and payments for interest and dividends of all the railroads of the United States for the year covered by this issue of the Manual. This year is called 1881 in the table and comments of it, but it is not the same for all roads, and probably for more than half of the roads the report is for a year ending earlier than December, 1881—a large number report for the year ending with June, 1881, and a still larger number for the year ending with September; among the latter being all the New York and nearly all the New England roads. It is important to bear this in mind; for the year ending with June, 1881, did not suffer from the railroad war; and the year ending with September suffered scarcely at all from the bad harvests of 1881. The year covered by the Manual was in fact an exceptionally favorable one for most of the roads, probably; while the calendar year 1881 was much less favorable than 1880.

Taking the whole system of which the Manual has information, the following comparisons are shown of 1881 with 1880:

	1881.	1880.	Increase.	P. c.
Miles of road in operation	104,813	95,455	9,358	9.8
Miles of sidings and second track	26,211	21,978	4,233	19.2
Miles of steel tracks	49,063	33,680	15,383	42.7
No. of locomotives	20,116	17,949	2,167	12.1
No. of passenger cars	14,548	12,789	1,759	13.8
No. baggage, mail and express cars	4,976	4,786	190	4.0
No. freight cars	648,295	539,355	108,940	20.2

The increase of nearly 10 per cent. in road constructed is very nearly correct. The Manual aims to give the total mileage of road *in operation* at the close of the year; but the distinction between track laid and road in operation is not always made by the companies reporting; and some companies do not report. Last year the Manual got trace of 1,784 miles of road not previously reported and not constructed in 1881. It reports this with the new construction under "annual increase of mileage," but it belongs to the construction of some (probably several) previous years. We have not yet completed our statistics of road constructed in 1881 (including all on which the track was laid, whether opened for business or not), but the total was not far from the 9,358 miles reported by the Manual as opened for business that year.

Probably mileage is reported more completely and accurately than any of the other data given in the above table, and where 1,784 miles of road were discovered in one year, it is quite probable that a good deal of accessory tracks, steel and equipment were also discovered, and that the enormous increase in the report for 1881 over what was given in the report for 1880 is more than the additions made during the year. It was, however, a year of great additions to equipment, so much so that a year ago all the locomotive and car works were crowded to their utmost capacity, and for more than a year had been working with all the rapidity possible. But it is not probable that there was an addition of as much as one-fifth to the mileage of second tracks and sidings in that year; many of the busiest roads, we know, and single-track roads at that, made but small additions; nor it is probable that 15,383 miles of road were laid with steel rails, in addition to the renewals of worn-out steel, or that 108,940 freight cars were added to the equipment of the country in addition to the cars renewed, which were probably about 40,000. It is rather probable that the previously imperfect statistics of the Manual have been made more complete—a process that has been going on all the time, and doubtless is not finished yet. The figures in the new Manual should be nearly complete, however. They show 130,536 miles of *track* in the United States, which is 1.25 miles per mile of road. There are 5.19 miles of road to each locomotive and 7.17 to each passenger car; but there are 6.21 freight cars for each mile of road. The cars and locomotives all coupled together would make a train 4,375 miles long.

The capital and earnings of the roads reporting (the mileage being that of the roads reporting for a fiscal year to the Manual, and so not including the road not completed till near the close of the year) are given below:

	1881.	1880.	Increase.	P. c.
Miles reporting.	94,486	84,225	10,261	12.2
Stock and debt.	$6,010,389,579	$4,879,401,997	$1,112,987,582	22.7
Freight earn'gs.	551,968,477	467,748,928	84,219,549	18.0
Passenger "	173,356,642	147,653,003	25,703,639	17.4
Total earn'gs.	725,325,119	615,401,931	109,923,188	17.9
Expenses.	448,671,000	360,208,495	88,462,505	24.6
Net earn'gs.	276,654,119	255,193,436	21,460,683	8.4
Dividends.	93,344,200	77,115,411	16,228,789	21.0

We see that with an increase of 10,261 miles in the roads reporting, an increase of about $1,113,000,000 in capital is shown, or an addiiion of $104,700 per each additional mile. This is doubtless due to large additions to the capital accounts of several of the old roads; for the capital of the new roads was doubtless less than half that amount.

It should be noted, however, that there are different statements of the capital (stock and debts) in different parts of the Manual. In the small table of the introduction it is given as $4,897,401,997 for 1880, while the large table of the Manual made the sum of stock, funded and floating debt for that year $5,108,241,906, and omitting unfunded debt makes it $4,945,751,997; and the large table for 1881 makes the total $6,314,699,787, and $6,101,933,520 without unfunded debt, against $6,010,389,579 in the small table (assuming that the first figure misprinted "3" there is meant for "6"). When the unfunded debt is omitted, the differences are not important. The great addition to capital during the year brings up the stock and bonds per mile of road from $60,650 to $63,611, or nearly 5 per cent. The reported *cost* increased $924,387,634, or $188,600,000 less than the reported capital. These enormous figures, equal to half of the national debt now outstanding, show how truly enormous is the change of floating into fixed capital, when railroad construction is as active as in the last two years. The increase in railroad capital was so much greater than that in population that, whereas, at the beginning of 1881 there was $96 of railroad stock and debt per head of population in the United States, at the close of 1881 there was $114.50. These sums do not appear large, but the total capital of all kinds per head of population is much less than most of us suppose. The value of the whole corn crop in the most productive year was not so great as this addition to railroad capital.

The increase in earnings was nearly 18 per cent. and at nearly the same rate in freight and passenger business, and much greater than the increase in mileage, the average per mile being $5,842 for freight and $1,835 for passengers, or $7,677 in all in 1881, against $7,307 in 1880, an increase of 5 per cent. Four-fifths of the large increase in earnings, however, was absorbed by the increase in working expenses, which was no less than 24½ per cent. The result was that the increase in net earnings was but $21,460,683, or 8.4 per cent., and the average net earnings per mile *decreased* from $3,030 to $2,928, or 3.4 per cent.

The great increase in expenses was one of the most striking features of the year covered by the report; and the increase did not stop then. A great many of the reports in the Manual are for the year ending with September last, and many others for the year ending with June, 1881, and the reports since that date and the few covering parts of this year show a continuance of the increase in expenses.

Not quite four-fifths of the increase in net earnings went to increase dividends, forming the substantial addition of 21 per cent., and a much larger sum than was ever paid in dividends before. The average dividend was small, however; only 2.92 per cent. on the stock, against 3.02 the year before; for while the amount divided increased 21 per cent., the amount of stock increased 25 per cent. The net earnings were at the rate of 4.60 per cent. on the aggregate stock and debt in 1881, against 5.00 in 1880. This percentage had increased constantly since 1877, when it was but 3.74, but it decreased constantly from 1871 to 1877. The great increase in capital reduced the average income on it last year.

The amount paid for interest on funded debt during the last year was $128,887,002, and this with the dividends makes $222,231,202 actually *paid* as interest on the $6,010,000,000 of capital, which is at the rate of 3.7 per cent. The interest payments were sufficient for 4.46 per cent. on the $2,890,497,364 of funded debt. As the average rate of interest on bonds outstanding is probably about 6 per cent., this indicates that a good deal of interest was not paid, which was the case with a vast quantity of New York, Pennsylvania & Ohio bonds and other companies' income bonds.

The capital, earnings, etc., per mile of road of the railroads of the United States as reported in Poor's Manual for eleven successive years have been:

Year.	Stock and debt.	Gross earnings.	Expenses.	P. c. of ex. to earn.	Net earn.	P. c. of net earn. on capital.
1871.	$59,726	$9,040	$5,863	64.8	$3,177	5.32
1872.	55,116	8,116	5,224	64.4	2,892	5.25
1873.	57,136	7,947	5,172	65.1	2,775	4.86
1874	60,944	7,513	4,776	63.6	2,737	4.49
1875.	61,533	7,010	4,425	63.1	2,585	4.20
1876.	60,791	6,764	4,228	62.5	2,536	4.16
1877	61,650	6,382	4,075	63.8	2,307	3.74
1878.	59,040	6,232	3,847	61.7	2,385	4.04
1879.	58,070	6,244	3,670	58.8	2,610	4.49
1880.	60,650	7,307	4,277	58.5	3,030	5.00
1881.	63,611	7,677	4,749	61.9	2,928	4.60

Gross earnings, we see, fell off every year from 1871 till 1878, and have risen since 17 per cent. from 1879 to 1880 and 5 per cent. from 1880 to 1881. Expenses decreased yearly from 1871 to 1879—one year longer than earnings—but have advanced in the last two years nearly as much as they had fallen in the previous five years. Net earnings have varied much less than gross earnings; but they fell from 1871 to 1877, and then rose for two years, but fell off last year again, remaining larger, however, than in any previous years except 1871 and 1880. Of the proportion of net earnings to capital, we have already spoken.

The growth of profits will doubtless show a greater interruption in the next Manual than in this one. Its figures will be more affected by the railroal war and the bad crops of 1881. And as mileage has gone on increasing all the time at the most rapid rate, it is probable that there will be a further decline in the average profits per mile of road. The effect of this season's harvests will be felt comparatively little in the earnings reported in next year's Manual.

HOW UNIFORMITY IN CAR CONSTRUCTION CAN BE BROUGHT ABOUT.

In an article on the "Reorganization of the Master Car-Builders' Association," published June 23, an attempt was made to indicate the amount of saving which could be effected if, through the influence of that Association the construction of cars was improved so as to make them last longer and cost less for repairs. To what extent these results can be attained by the adoption "of improvements which are made by simplifying details, adopting better methods of putting work together, and rendering cars more substantial and more serviceable," and by making them uniform, it is, of course, impossible to foresee or foretell. That a very considerable improvement is possible, however, no person with any considerable amount of practical knowledge of car construction and experience in mechanical design can for a moment doubt. That an enormous saving can be effected in this way can be conclusively shown, and it may be said without hyperbole that "there are millions it."

But, it may be said, these statements are very general in their character, and some may be inclined to ask that the means by which these ends are to be accomplished be more distinctly indicated. They might add that it is very well to say that large sums of money will be saved to railroad companies by improving the construction of cars, but who is to devise and suggest the improvements? How can it be known that the latter are judicious, and what means must be adopted to secure the general adoption of the best things? It is proposed in this article to make some reply to these questions. They will be taken in their inverse order, beginning with the last first. To show how the general adoption of any feature in car construction may be brought about, we have only to consider how two or three men manage to agree about any measure. Or let us suppose that three of the trunk lines should determine to agree upon, say, a standard draw-gear—how would they go about it? In all probability representatives of each of these lines

would meet together and try to agree on some plan which would be considered by all of them to be the best. If they did so agree, it would only remain for their companies to adopt what their representatives recommended. Now this is precisely the method which the reorganization of the Car-Builders' Association supplies for bringing about an agreement of all the railroads in the country. Therefore it has taken one essential step to accomplish the results described above.

But as was set forth in a previous article, * "in most cases the aim of the Association must be to *agree* upon the *best* form of construction." In other words, there must be some means provided of *finding* or of indicating which is the best form of construction. This must necessarily be antecedent to the agreement. Thus, the three representatives of the trunk lines, if they met together, must learn which is the best form of draw-gear before they can or should agree in recommending its adoption. Merely meeting together and discussing the merits and defects of a piece of mechanism is a very different process from that of designing or originating it. The one is simply deliberation, that is, it becomes a question whether one of two or more methods of construction shall be adopted; the other is evolution, invention or discovery; that is, it is finding the best of all possible means, as nearly as this can be done, for accomplishing the end sought. Inventions, discoveries or designs are not made by committees or deliberative bodies. These latter may determine whether this or that is the best, but they have no faculty of originating the best forms of mechanism. Perhaps a concrete example will illustrate this better than theory. Some years ago the German Railroad Union took up the subject of a standard draw-gear for cars, and appointed a committee to investigate it. This committee first proceeded to calculate the strength of the parts of the gear, which indicated the weak points. To confirm the results of their calculations they then tested the appliances whose strength had been calculated, and it was found, as was expected, that they broke at the weak points indicated. They then calculated how much additional strength was required at the weak places and increased them accordingly, and then tested the apparatus again until a uniform and sufficient amount of strength was secured in all parts. This was a process of evolution in which science guided and experiment confirmed the deductions. This kind of work is impossible in a deliberative body, but after one or more individuals have demonstrated certain things in this way, then the function of the Association may be exercised, that is, when by the method described, or analogous methods, the best form of construction has been evolved, then the Association may agree to recommend or adopt what has been shown to be the best. The evolution process is necessarily an individual one; the deliberation or the choosing from a few or many alternatives and agreeing on one is the work of the Association.

It is not intended either to assert that the science should be the only or even the chief guide to indicate what may be called the *bestness* of methods of constructing cars. As Dr. Holmes says: "Science is a first-rate piece of furniture for a man's upper chamber, if he has common sense on the ground floor." For devising standard plans for constructing cars, science alone would be a most treacherous guide. Without practical experience, and a great deal of it, the most egregious and expensive blunders would be certain to be made. But a person might have a whole lifetime of experience in building cars and yet be quite incompetent to do the work which must be antecedent to that which the Car-Builders' Association should do. Nearly all of its members have had years of practical experience in repairing and constructing cars, and yet there is no reason for hesitation in saying that there are very few of them who have the skill in designing work which would qualify them to originate or indicate what the standard plans should be. Not one car-builder in twenty has a sufficient knowledge of drawing to be able to represent his ideas with such precision and accuracy that such representation would be a reliable guide to work by. Drawing is not only the language of mechanical design, but it might be called the skeleton which sustains the active organs of invention. A drawing to a designer becomes as it were a fulcrum, or rather a series of fulcra, on and about which the wheels and levers of his thoughts act. It is besides the record of a designer's thoughts, and represents them more precisely than they could be recorded in any other way. A good designer of mechanical work must be a more or less good draftsman; if he is not, he is like an orator who is dumb, or an author who cannot write.

* See *Railroad Gazette* of June 23.

The need of adequate knowledge of drawing in conducting the affairs of the Car-Builders' Association has been illustrated more than once. Soon after the standard axle was recommended for general adoption it was found that there were about a half-dozen different drawings and engravings, all purporting to represent it correctly, but all differing in some slight particulars. Fortunately, in the essential dimensions they all agreed. When the standard journal-bearing, box and pedestal were adopted, the Association was less fortunate, as the lithograph of those parts which was made and distributed was so imperfect that differences in the patterns were inevitable if made from it by different pattern-makers, and it was found that even the journal bearings were often, for this reason, not interchangeable.

Happily this has all been remedied by the appointment of a new committee, which had new and correct engravings made of the parts named, but there is not to-day a single drawing of any of the standards recommended by the Association properly attested and filed away among its archives. In some cases it is difficult to tell what the action of the Association has been. It is hardly necessary to point out that if it ever establishes standards for car construction, it is absolutely essential that these standards should be described by accurate and properly made drawings, and that these should be carefully preserved and recorded. Otherwise there will be no end to the errors and confusion which will result.

The recent amendment to the constitution of the Car-Builders' Association has provided the organization to bring about agreement of the members, but this must be supplemented by some provision for the evolution of the best methods of construction, and to indicate what they are. As has been pointed out, such work must be done by individuals. What the Association needs, therefore, is the services of one or more persons having a high order of ability to design cars. He or they should have a fair knowledge of science, a great deal of practical experience, should be cautious and prudent, and have a good deal of the judicial faculty, which would enable him to collect all the evidence attainable bearing upon any question for decision, and to draw correct conclusions therefrom. He should have a certain amount of mechanical ingenuity, but this should be well under the control of a wise conservatism. He should have, above all, the faculty of design, which is so difficult to describe and which, to a very great extent, is a natural gift; but which, like many other things in nature, has not much value until it has been cultivated by a long practical training. It goes without saying that a person to do the work which the Association should have done must be scrupulously honest, with a capacity for resisting bribes which is above temptation. If the Association can secure the services of such a person it will result in the saving of millions of dollars to the railroads of the country. It seems quite certain, too, that if it does the work which is before it to be done, it must be accomplished through the exertions of one or more persons with some if not all the qualifications described.

EMPLOYERS' LIABILITY CASES.

The frequency of suits by employés to recover from the companies for each other's neglect or default shows that the principles governing an employers' liability to his servants are not, in this country, as fully understood as they should be. In England they were formulated by Parliament, in 1880, in the well-known "employers' liability act." This is, however, only a temporary or experimental settlement; it was enacted for about seven years only, nearly two of which have expired; so that, before long, English discussion of the subject must arise anew. According to statements of Sir Frederick Pollock, in a paper included in a volume of his "Essays," just published in England, the doctrine of English law that an employer is not liable to one employé for the misconduct or neglect of another is rejected in continental jurisprudence, in Germany especially; and in England and the United States it is modern; while in Scotland it was not so much adopted from England as thrust upon the Scottish courts by decisions of the House of Lords. He, however, argues, in discussing the higher ethical aspects of the subject, that the rational foundation of an employer's liability to the public for acts of his servants is not merely that he is supposed to order all that his servants do, for the liability is daily extended to injuries resulting from violation of orders, but that the undertaking or enterprise is carried forward by the servants for the master's profit or advantage. In other words, to speak particularly of railroad companies, the damages for hurts inflicted incident to the operations of the road may justly be a charge upon the profits and capital invested, aside from the question of personal fault on the part of the direction. He would, we judge, enlarge somewhat the redress allowed to employés for each other's defaults. His views are well worthy of general attention in this country. There is, however, a public necessity for limiting the liability of companies for servants, so far at least that new enterprises and great undertakings shall not be quenched by it. And there is a certain justice in limiting the liability as toward servants, from the facts that they enjoy—what the general public, when trusting to the management of the road, do not have—means and opportunity of judging for themselves, partly, at least, what risks they will incur, and of demanding wages proportionate to their risk as well as to their dangers. The risks of an employment are always an element in determining wages, and the higher wages paid in a dangerous employment are practically the insurance paid for its special risks. The industry having in its wages paid for the risks incurred, it is held to be unjust that it should also have to pay the damages which occur when injuries actually occur. Such, at least, we believe to be the chief grounds on which American courts have been inclined to sustain the exceptional rule; they consider that railroads are a public necessity and must not be overwhelmed by legal liabilities; and that it is not needful to press the liability to employés to an extreme in the courts, since it may properly be a subject of adjustment beforehand, in the arrangements between the companies and the men.

Judge Dixon, of New Jersey, in a recent charge to a jury, stated the principle more graphically than usual. The suit was by a machinist employed in a railroad repair shop, and the Judge explained that the plaintiff, when he entered the company's service, said, in legal effect to the management:

"I enter your employ as a machinist, and go into the erecting shop used for the repair of engines. I accept as compensation the money which you agree to pay, not only for the value of my labor, but for all the risks which I necessarily assume and expose myself to from the carelessness of my fellow-servants engaged in the same business. I am aware as to how the business must be carried on. The defective engine must be brought into the shop. I see the machinery by which this is done. There is a stationary engine, with its engineer, upon a transfer table. There is a locomotive with its engineer to furnish the motive power to get the defective engines into the shop after the transfer table has brought about the necessary connection of the tracks. I know that it is usual, in repairing boilers, to remove the wheels, place the boiler under chucks, and perform the work over the track. Knowing all these facts, I enter the service and take the risks which may arise from the negligence of my fellow-servants engaged in the same business or common employment."

The special aspects or nice distinctions of the American doctrine which are illustrated by the decisions reported in a month or two past, are: What servants are employed in the same general business? and; What is the company's liability for personal defaults of managers or superior servants? In a New York case a switchman, from sheer inattention and carelessness, failed to adjust his switch properly, a through train ran off the track in consequence, and the fireman on the engine was killed. The ruling of the Court of Appeals was that fireman and switchman are fellow-servants, and that there could be no recovery. This tallies with former decisions, which have generally been to the effect that two men need not be working in company to be fellow-servants; they are fellows whenever they are employed under the same general direction to produce the same result. Fireman and switchman are employed toward the same result, namely the safe movement of the train from station to station.

In an Iowa case there had been an attempt to wreck a train by placing obstructions in its way, and the company employed a detective to search for the offenders, directing him, according to his story, to examine a section of the track, walking upon it for the purpose. While he was doing this he fell insensible from sunstroke, and the engineer of a passing train negligently ran the engine upon him. The court said that, according to former Iowa decisions, he could not have recovered, because both servants were engaged in the same general business. We think that most American courts would distinguish between an ordinary track-walker engaged in looking for obstructions in the way of an approaching train—who doubtless is engaged in the same general business with the engineer—and a detective employed to examine obstructions placed upon the track upon a former occasion, and for the purpose of bringing the culprits to justice. However this may be, the suit of the Iowa detective was sustained by favor of a special statute of the state which allows employés to recover from the company for each other's default, notwithstanding they may be fellow-servants.

In the New Jersey case already mentioned, the plaintiff was a machinist employed in the repair shop, and was at work there repairing a boiler, when an engineer mismanaged the engine under his charge so

grossly that it broke through the closed doors of the shop, struck the boiler on which the machinist was at work, and bruised and injured him. The judge instructed the jury to inquire whether the men were both engaged in the business of repairing the company's engines and cars, that is to say, whether the engineer's work was bringing an engine or car to the shops for repairs. The jury found that they were not so engaged, and awarded the plaintiff $2,500 damages. The judge's charge supports the view that an engineer employed in the yard in making up trains with roadworthy cars and engines is not in the same general business with workmen in the machine shop, employed in mending those which are out of repair.

The liability for neglect by superior servants is illustrated by a Minnesota case. The employé injured was a laborer in the company's yard whose duties included coupling cars under direction of an assistant yard-master; and his hurt was received partly because the tender to which he was to couple a car was not supplied with a link, and partly because the assistant yard-master neglected to signal the engineer to slow up when approaching the car which was to be coupled. The proof showed that the management did not maintain any rule requiring the tenders to be supplied with links; the custom was to leave links scattered about the yard, ready to be picked up and used by any employé when making a coupling. And the jury found that this was not a safe and proper way for the company to manage couplings, but the tenders and cars ought to be supplied with links; also that the assistant yard-master was in command of the affair, and failed to give a direction which he ought to have given to the engineer. The Judge said that on these facts the man was entitled to damages. The rule as to negligence of a fellow-servant did not apply. If a railroad company sees fit to invest one of its servants, here the assistant yard-master, with control or superior authority over another with respect to any particular part of its business, the two are not, with respect to such business, fellow-servants. The superior stands in the place of the corporation and the other is subordinate to him. This principle is further illustrated by a recent Missouri decision in favor of a boy employed in a foundry at a task near a dangerous revolving shaft. The foreman sent him to stop the engine, and he started to do so. The foreman told him to "hurry," and, in obedience, he took the shortest way, which involved stepping over the shaft, instead of a longer way around it. His clothing was caught in the machinery and his leg crushed. The Court held that as he was acting in direct obedience to orders of a foreman whom the employer had directed him to obey, the employer was liable. This is in accordance with the new English law, which prescribes that an employé who meets with an accident due to the negligence or lack of skill of another employé under whose orders he is placed, may recover from their common employer. Previously a brakeman and a superintendent were held to be fellow-servants, and the company was not liable for the negligence of the latter which caused the former to lose life or limb.

According to the London *Law Times*, the year's experience of the practical working of the English act has not developed a decided opinion as to its benefits. The unfavorable anticipations formerly expressed that it would lead to a flood of lawsuits instigated by practitioners of the lower class have not been realized; fewer than a hundred suits have been brought under the act, and the aggregate of recoveries is estimated under £3,000. Thus it has not borne heavily on employers. On the other hand it has not materially aided workmen; partly because it does not abrogate the doctrine as to servants in "a common employment," and partly because its provisions are vague and indefinite and await the slow progress of the courts in determining their meaning and effect. An amendatory law has been introduced in Parliament.

So far as the equitable compensation of employés is concerned, it is probable that it will settle itself very well under the rule that requires the employé to take the risk of the negligence of his fellow-servants. If there is anything which makes an occupation undesirable, whether it be exhausting labor, great discomfort, unhealthfulness, or exceptional liability to accident, it leads the workman to avoid that employment, and he must be given some corresponding advantage—usually higher wages than the average, but sometimes shorter hours or privileges of some kind—to induce him to adopt that occupation.

The argument in favor of increasing the liability of such employers as railroad companies for accidents to their employés by accidents rests rather on grounds of public policy than of justice to the men. If the occupation is made much safer, the average of wages paid will inevitably, in the course of time, fall, in comparison with the wages paid in other occupations. That is, if the risks of the employment are removed, the company will no longer pay for them in wages. But it is desirable that the risks should be removed, and that the companies should have strong inducements to remove them. They now have strong inducements to prevent accidents to passengers. A single one has cost more than half a million dollars in compensation alone. They have less inducement to avoid accidents to employés, because they do not have to pay for most of these, except in the indirect way of higher wages. And the small class of employés suffer much more from accidents than the great class of passengers, and many of the accidents to them are avoidable, and in course of time would probably be avoided if they were very costly to the railroad companies.

Crop Prospects.

The Department of Agriculture reports that the condition of the cotton crop July 1 for the whole United States was 92 per cent. of an average condition, against 95 per cent. last year. This average condition of 92 is lower than for eight years past at this time, but there was an improvement in condition from 89 to 92 during June, and with circumstances favorable the crops may be as large as in any other year except 1880. It was drought after July 1 that made the crops light last year. The acreage this year is about 3 per cent. less than last, so much more land has been devoted to grain, especially oats and corn.

Compared with last year the condition is higher in South Carolina and Texas, the same in Louisiana, and lower in the other states.

The report of the Department of Agriculture for July 1 gives the average condition of winter wheat for the whole country as 104—better than in any previous year—while spring was 100, against 90 last year. California's average had risen from 77, June 1, to 90, while the great producing states of the Mississippi Valley are all above an average: Kansas, 116; Missouri, 111; Illinois, 105; Indiana, 104; Ohio, 101, and Michigan, 106.

The harvesting of winter wheat is completed in the South, and further north than the latitude of St. Louis, and is far advanced in all parts of the winter wheat region except Michigan and Northern Ohio. The crop is almost everywhere good, but frequent rains have somewhat injured it where the harvesting was done in July, as generally north of the latitude of St. Louis. The area is less than last year, but the yield immensely greater than the very bad one then, and the aggregate yield east of the Pacific Coast is probably but little less than that of 1880, which was the largest ever known. In Kansas the State Board of Agriculture reports an average yield of 20.7 bushels to the acre, so that, in spite of a very large decrease from the acreage of last year, the crop is much the largest ever harvested, amounting to about 28,800,000 bushels. This estimate, however, is made before any considerable amount of threshing has been done, and is liable to revision, and large crops are almost always over-estimated. The same authority estimates that there will be about 2,000,000 bushels of spring wheat in Kansas.

The condition of spring wheat was reported, July 1, by the Department of Agriculture at 105 in Nebraska and 102 in Iowa, but slightly below an average elsewhere—98 in Minnesota and Dakota and 94 in Wisconsin, which is less favorable than non-official reports.

Spring wheat generally promises well. The weather has been unusually cold and wet, which has caused it to grow well, except on the wetter lands or where the rains have been greatest, and there the wheat has suffered somewhat. In Southern Nebraska the crop is nearly mature, and has few dangers to escape, in Minnesota, Dakota, Wisconsin and Northern Iowa a week or so of very hot wet weather about this time has been known to change the condition from the very fairest promise to an almost utter failure; but the chances are greatly in favor of a good yield. The acreage is about 10 per cent. less than last year.

The weather that has been so favorable for wheat and other small grains (also for grass) has been very unfavorable for corn, and in the states which produce most of this grain, Illinois, Iowa, and the northern half of Indiana, this most important of our grain crops has rarely been in so bad a condition at this time of year. It was not last year, but the great damage to corn that season was caused by protracted drought after this time; and with fair weather hereafter the crop this year will probably be larger than last, in spite of the present bad condition. The condition this year is not so bad in Western Iowa and in Southern Illinois as in other parts of those states; but the area planted to corn there, especially in Southern Illinois, is comparatively small. On the other hand the condition is decidedly bad in Northern Illinois, which last year had nearly an average yield, and received more for its crop than ever before. In many places farmers say that half a crop is all that they can expect with the most favorable weather hereafter, but there are great differences in condition from farm to farm and from neighborhood to neighborhood, as the rainfall has varied greatly, from almost daily showers to frequent torrents. It is generally assumed that if there is a fair stand of corn on the 1st of July there may be a good crop with hot growing weather thereafter; but this year in the first week of July fires were needed for comfort in the evening, and there was a cold northeast rain almost daily west of Chicago. In Texas, corn is suffering for want of rain, but it is not too late for it to recover.

In Kansas and Nebraska corn is late, but promises well, and further north than Iowa and Illinois the condition is less bad than in those states; but the area there is comparatively trifling, though larger than in previous years. In the South, where the average is much larger than usual, the prospect is good except in Texas, where it suffers from draught. But Illinois and Iowa together usually produce more than one-third of the total, and corn there is incomparably the most important grain crop. Thus the acreage and yield in these states and in the whole United States have been:

	1879.	
Illinois:	Acres.	Bushels.
Wheat	3,218,542	51,110,502
Corn	9,019,381	325,792,481
Iowa:		
Wheat	3,049,288	31,154,205
Corn	6,616,144	275,023,247
United States:		
Wheat	35,430,052	459,479,505
Corn	62,368,870	1,754,861,535

	1880.		1881.	
Illinois:	Acres.	Bushels.	Acres.	Bushels.
Wheat	3,650,225	60,958,757	3,285,200	26,822,000
Corn	8,840,180	240,452,896	9,096,600	176,733,000
Iowa:				
Wheat	3,190,212	33,178,205	2,775,500	18,248,000
Corn	6,847,180	260,192,840	6,710,200	173,289,000
United States:				
Wheat	37,986,717	498,549,868	37,709,000	380,280,000
Corn	62,317,842	1,717,434,543	64,262,025	1,194,916,000

The report of the Department of Agriculture for July 1 shows that the area planted to corn in the whole United States was 4 per cent. greater than in 1881. The increase was much greater in the South, and the farmers had intended to plant more in the states of the upper Mississippi Valley, but bad weather prevented. A still greater effect on the area planted was caused by the late spring of 1881. This year there was a smaller acreage than last in Ohio, Indiana and Illinois, which in 1880 produced 460,000,000 bushels, out of a total of 1,717,000,000, and in 1879 produced 553,000,000, out of a total of 1,755,000,000 in the whole United States. The average condition of corn for the whole country is reported low.

Illinois and Iowa together produced 18 per cent. of all the wheat in the country in 1879, 19 per cent. in 1880, and less than 12 per cent in 1881. Of the corn they produced 34.3 per cent. in 1879, 29 per cent. in 1880, and 29 per cent. in 1881. The value of their corn crop was probably nearly four times that of their wheat crop last year, and this year they have increased the area of corn, and largely decreased that of wheat, so that a failure of the corn crop will much more than counterbalance the good wheat crop, and make the year more unfavorable than the average. It will, however, unless corn should turn out even worse than seems probable now, be very much better than last year; good in every thing but corn, and better in corn than last year; while last year all crops were bad. And as the failure of the corn crop was almost universal last year, and is limited (so far) to about one-third of the corn country this year, the prospect for the whole country is very much better than last year.

In estimating the effect on traffic, however, we must remember that the effect of the falling-off of more than 500,000,000 bushels in the corn crop of 1881 will be felt for a long time to come. Ordinarily, not much of the new corn crop is marketed in the year in which it is grown; that is, the new corn does not come forward freely until January. At this time there is very little corn left in the country that can be spared, while little more than half of the shipping season is over. This is felt much more than anything else in the grain movement at this time. Thus for the week ending July 1, corn receipts at the eight Northwestern markets were but 838,366 bushels this year, against 4,951,311 last year, and an average of 2,456,000 in the corresponding week of the three previous years, and in all these years the corn receipts have been much larger than the aggregate of all the other grain receipts at this season (before the new wheat begins to come forward).

But the effect of the short corn crop of 1881 will not be limited to the year 1882. The high price of corn has made it very costly to keep stock hogs, and at the same time made pork very dear, and this has led to a

material reduction of the number of hogs in the country, which can hardly be made up until the year 1884, and will probably be shown in a considerable reduction in the number packed until that year.

It is doubtless better for the country that the effects of the very bad crops of last year are distributed over so long a time; but one of the results has been that the extent of the disaster has not been sufficiently appreciated by the community. If it had not been preceded by four unusually favorable years, it would have been felt more.

The bad prospect for corn in a part of the country which produces about one-third of the total is decidedly unfavorable to the prospects of the traffic during the coming year; but as nearly all other crops promise well, including oats and grass, which partly take the place of corn, and corn itself promises to be an average crop in most other parts of the country, where there is a considerable increase in acreage (against a decrease in wheat and cotton), the crops as a whole will very likely be equal to the average, though less than in 1880 and 1879, when they were extraordinarily favorable. The most unfavorable feature is that there is so little increase in the acreage under cultivation, at a time when population and other industries have increased greatly. The same production in 1882 as in 1880 even would not mean the same prosperity, for in those two years the population of the country has increased doubtless about 3,500,000, or 7 per cent. (the increase by immigration has been more than 3 per cent.). A corresponding increase in production—at least in acreage cultivated—should be made if our great national industry was holding its position; but there seems to be very little increase, very much less than 7 per cent., at all events. With the very best crops possible this year, the business of the country will not be made as prosperous as in 1880, and those who expect it are likely to be disappointed, though they are right in calculating on much better crops this year than last.

The Hydrogen Gas Engine.

This machine, which has a habit of appearing periodically like the sea-serpent, has according to the daily paper, been out again and has been "drawing cars." In other words, another engine which is to use petroleum for fuel has been completed at the Grant Locomotive Works in Paterson, and has just been tried on the Newark Branch of the Erie road.

There is a charming indefiniteness about the accounts which give the amount of work done, and the only clue afforded is the statement that the load hauled was "a full-fledged passenger train." It took, according to the inventor, 84 gallons of oil to draw this feathered load 19¾ mile over some moderate grades at a cost of $2.10. As the average cost for fuel on the railroads of the country is only about 6 cents per mile, or $1.18½ for the distance named, it is not clear where the economy of the hydrogen gas engine comes in.

The following is the kind of nonsense that is published about this "great discovery":

"The inventor explained that the new locomotive is fueled with hydrogen gas, which is constantly reproduced by its own heat from water through the mediation of a small proportion of crude naphtha. No oil is burned in this process in the ordinary or popular sense of combustion. It is used exclusively within retorts without air as a decomposing agent for steam. The high temperature of the fire chamber in which the retorts are set keeps them sufficiently hot to disengage the oxygen of steam in the presence of the carbon of the oil in their interiors, the chemical attraction of these two elements causing them to unite in the proportions of perfect combustion, and to become entirely converted into carbonic acid within the retorts. The released hydrogen is therefore the only combustible ingredient left to issue at the burners at the height of the process. At the same time the heat of both processes—the decomposition within the retorts and the combustion outside of them—is confined and utilized within the boiler for the making of steam. So great is this heat that if the decomposing agent (oil) be shut off it has been found that the steam continues to decompose by heat alone, and to issue with intensified combustion at the burners for a considerable time."

It is also reported that the right to build such locomotives in France has already been secured, and a company known as the New York Heat, Light and Power Company to construct them in New York has already been incorporated. We have heard of the latter company before, and wish that neither it nor its "gas engine," which has been thrust upon the attention of the public so often, would never be heard of again. There probably are some persons who, in the near future, will unite with us in that wish.

The Rensselaer Polytechnic Institute.

An effort has recently been made by the graduates of this nursery of engineers, to raise among themselves an endowment fund of $100,000, hoping that by their own liberality others may be induced to suppliment their efforts, and thus enable the Institute to extend the boundaries of its course of insruction, to add others, and, not only to maintain its present standard of scolarship, but to establish a still higher one in the near future.

The first report of the Endowment Committee, recently made, announced the fact that $25,000 had already been subscribed and more is promised. Great care has been taken to insure the proper management of the fund, and considering the fact that Rensselaer has supplied so many active and prominent men, who have been and are engaged in the construction and operation of railroads, it seems as though there could be no better purpose to which those who have accumulated millions in railroad operations could appropriate some of their spare thousands. Various professorships need to be endowed, scholarships established, and, if possible, the men and the means should be provided for making original researches in matters pertaining to railroad and other engineering. The Institute, as the pioneer ingiving a practical education to engineers in our country, is worthy of the support and help of all who rely on educated engineers for the success of their enterprises.

Record of New Railroad Construction.

This number of the *Railroad Gazette* contains information of the laying of track on new railroads as follows:

Alliance, Niles & Ashtabula.—Extended northeast to Niles, O., 17 miles, completing the road.

Buffalo, Pittsburgh & Western.—Extended from Brocton, N. Y., northeast to Dunkirk, 9 miles.

Carson & Colorado.—Extended from near Belleville, Nev., to White Mountain Summit, 23 miles. Gauge, 3 feet.

Chesapeake, Ohio & Southwestern.—Completed by laying track from Dyersburg, Tenn., south by west to Hatchie River, 32 miles.

Chippewa Valley & Superior.—Extended from Durant, Wis., southwest to the Mississippi, 12 miles, completing the road.

Denver Circle.—Track is laid for 4 miles in Denver, Col., making a line to the Exposition grounds.

Gainesville, Jefferson & Southern.—Extended southward to Jug Tavern, Ga., 7 miles. Gauge, 5 ft.

Georgia Pacific.—Extended from Douglasville, Ga., west to Villa Rica, 10 miles. Gauge, 5 ft.

Kansas City, Springfield & Memphis.—Extended east by south to Seymour, Mo., 23 miles.

Marietta & North Georgia.—Extended from Canton, Ga., northward to Ball ground, 13 miles. Gauge, 3 ft.

Natchez, Jackson & Columbus.—Extended from Utica, Miss., northeast to Raymond, 14 miles. Gauge, 3 ft. 6 in.

New York, Lackawanna & Western.—New track is reported laid from Alden, N. Y., east 20 miles, and from near Mt. Morris, N. Y., southeast 55 miles.

Northeastern, of Georgia.—Extended from Turnersville, Ga., north to Tallulah Falls, 4½ miles. Gauge, 5 ft.

Northern Pacific.—The *Pelican Rapids Branch* is extended northward to Pelican Rapids, Minn., 11 miles.

Richmond & Mecklenburg.—Track laid from Keysville, Va., south to Ft. Mitchell, 11 miles. Gauge, 5 ft.

Rochester & Pittsburgh.—This company has completed a spur from East Gainesville, N. Y., to Gainesville, 1 mile.

St. Louis, Des Moines & Northern.—The extension to Boone, Ia., is 3.3 miles longer than heretofore reported.

Sioux City & Pacific.—Track on the *Nebraska Division* is laid to a point forty-five miles west by north from Long Pine, Neb., an extension of 35 miles.

Union Pacific.—Track on the *St. Paul Branch* has been extended from St. Paul, Neb., westward 20 miles. On the track of the *Denver & South Park Division*, the track of the *Gunnison* branch is extended from Hancok, Col., southwest to Woodstock, 6 miles. This division is of 3 ft. guage.

West & East.—Extended from Gray's Mills, Miss., west by north to Lexington, 5½ miles.

West Jersey.—The *Salem* Branch is extended in Salem, N. J., 0.6 mile.

Wheeling & Lake Erie.—Extended westward to Toledo, O., 6 miles.

This is a total of 343 miles of new railroad, making 4,758 miles thus far this year, against 2,418 miles reported at the corresponding time in 1881, 2,228 miles in 1880, 1,035 miles in 1879, 791 miles in 1878, 710 miles in 1877, 846 miles in 1876, 457 miles in 1875, 727 miles in 1874 and 1,587 miles in 1873.

THE NEW YORK FREIGHT-HANDLERS STRIKE continues, though generally for the past ten days the roads have been able to handle nearly all the freight offered. The newspapers have commended the peaceful attitude of the strikers, but as they have assaulted and beaten and maltreated a great number of the men who have taken their places, and threatened the rest, and dumped several of them into the river, "peaceful" seems not quite the proper term. They have not usually attacked in force and as an organization, it is true; in a city with a great police force no body is likely to carry on open war; but they have most of the time kept the new men in fear for their personal safety, and last Tuesday there was a conflict between a party of the old men who were going for their pay, and a gang of Italians who were doing their work, in which several men were shot, and one thrown into the river. It is true that this does not appear to have been premeditated; but with their places all filled and the chances of getting them back lessening as the new men grew efficient, little more than a chance meeting was needed to lead some of the strikers to use violence; and the new men doubtless were the more inclined to meet force by force, and fists and sticks with knives and pistols, because of their very fear. The result of this contest was that not the strikers who made the attack but the Italians who defended themselves were arrested, on the charge of carrying concealed weapons! The charge is probably a true one, but it seems a strange time to make it when the men were unquestionably defending themselves against an unwarranted attack.

This riot naturally made it very difficult to get men to work the next day where it took place, and Wednesday the railroads were less able to handle freight than for some time previously. There can be no question that if the new men had not been frightened by the strikers, they would before this have formed a force entirely sufficient to do all the work; but if the companies had not been compelled to depend almost entirely upon recently arrived foreigners, they would have had a force less liable to be turned from their work by threats or fears of violence. Apparently there has been no considerable number of laborers resident in the country some time who have been willing to take the places of the strikers, and this may be advanced as evidence that they were not getting what their labor was worth. The very general sympathy expressed for the strikers by the newspapers and by such of the merchants and others as have had anything to say on the subject has, however, not only encouraged the strikers, but has discouraged other laborers from taking their places. But the strikers have a perfect right to use public sympathy for all it is worth, if they can secure it; what should trouble the railroads is that the strikers have the sympathy. It is not wholly because the men are liked, but also, it is to be feared, because the railroad companies are not liked. There can be no doubt that here is scarcely any degree of injustice to a railroad corporation which will provoke public indignation. This is a very dangerous condition of things, and will bear much reflection.

CHICAGO RAIL SHIPMENTS EASTWARD for the two weeks ending June 24 and July 1, have been, in tons, for the past three years:

Week to—	1880.	1881.	1882.
June 24	55,394	81,660	25,018
July 1	46,995	67,953	24,286

The week ending June 24 was the first week of the railroad war last year, and the shipments were then larger than ever before or since, except in the week ending March 27, 1880. We are now comparing with a period when the ruling rate last year was 15 cents per 100 lbs. from Chicago to New York for grain and flour, against 25 cents this year, and 30 cents in 1880. The decrease in the last week of June was 68 per cent. from 1881, and 53 per cent. from 1880; or the first week of July the decrease is 64 per cent. from 1881, and 48 per cent. from 1880. The *gross receipts* from the shipments for the two weeks may be roughly estimated at $614,000 in 1880, $449,000 in 1881, and $251,000 in 1882. At least, they must have varied about in proportion to these sums. The decrease at the rate of $98,000 a week from last year, and of $180,000 from 1880 in the shipments of this single city, is equivalent to $4,900,000 and $9,000,000 for an entire year—would of course be a very formidable matter to the roads east of Chicago if it were likely to continue; but these were weeks of exceptionally large shipments in both 1880 and 1881, while they are the weeks of nearly the smallest shipments this year.

The course of shipments from week to week since navigation opened has been as follows:

Week to—	1880.	1881.	1882.
April 8	56,429	53,020	38,988
" 15	...	73,362	33,232
" 22	37,522	68,110	30,272
" 29	30,263	58,866	29,528
May 6	27,000	22,351	28,273
" 13	24,485	36,046	22,364
" 20	29,067	52,888	24,556
" 27	34,218	47,523	27,124
June 3	32,403	40,029	26,762
" 10	42,504	37,600	28,514
" 17	68,360	54,266	28,753
" 24	55,394	81,660	25,018
July 1	46,995	67,953	24,286

Since April the variations from week to week have been less this year than in either of the others; there has been no increase in June, as in 1880, but a small decrease, due to the fact, doubtless, that the western stocks of grain and flour had been nearly exhausted, and the hog-packing was less than usual.

The percentage of the total shipments from and through Chicago by each of the roads to the East in the two weeks last reported, were:

Week to—	Grand Trunk.	Mich. Cent.	Lake Shore.	Fort Wayne.	P. C. & St. L.	Balt. & O.
June 24	8.9	21.9	20.4	27.8	9.3	11.7
July 1	10.5	20.2	18.0	31.1	11.1	9.1

The two Vanderbilt lines have a larger percentage than has been usual recently—42.3 per cent. in the first week, against 37.1 by the two Pennsylvania lines, and 38.2 in the second week, against 42.2 by the Pennsylvania lines.

For the week ending July 8, the shipments billed from Chicago (exclusive of the shipments billed through Chicago from points west, which are included above) were 13,251 tons this year, against 44,371 tons in the corresponding week of last year, and 16,252 tons in the previous week of this year. Shipments usually fall off in this holiday week. The decrease was wholly in grain and flour.

THE WEST-BOUND FREIGHT SHIPMENTS from New York were greatly reduced by the strike, especially during the first week that it was general, which was the one ending June 24. That week the shipments were 44 per cent. less than the week before, but the next week (ending July 1), when from the newspaper reports it would appear that there was very great interruption to shipments, they were 63 per cent. more than the week before and but 8 per cent less than in the week ending June 17. And for these two weeks of greatest obstruction by the strikes the shipments were very nearly equal to the average shipments for two weeks in the year 1880, when they were much larger than they had ever been before, though much less than in 1881 under the stimulus of the low war rates; and, taking the whole month of June, the total shipments were at least a fifth larger this year than last, in spite of the strike.

THE ADVISORY COMMISSION, which is to recommend an adjustment of the differences in the rates between the West

TABLE SHOWING THE MILEAGE, CAPITAL, COST AND REVENUE OF ALL THE RAILROADS OF THE UNITED STATES FOR THE YEAR 1881.

[From advance sheets of the new issue of Poor's Manual of the Railroads of the United States.]

STATES, ETC.	RAILROAD. Length of line.	Sidings, etc.	Steel rail.	Engines.....	CARS. Passenger	Bag., mail and exp.	Freights, etc.....	CAPITAL ACCOUNT. Capital stock.	Funded debt.	Other liabilities.	Total capital.	Cost of railroad and equipment.	Aver. railroad worked.	REVENUE ACCOUNT. Gross earnings.	Working expenses.	Net earnings.	Interest on bonds.	Dividend on stocks.
	m.	m.	m.	No.	No.	No.	No.	$	$	$	$	$	m.	$	$	$	$	$
Maine	1,094.12	207.44	459.65	92	167	108	2,415	17,780,492	20,743,300	702,168	39,285,960	40,473,216	1,025.43	4,241,738	2,929,801	1,311,937	1,012,436	467,280
New Hampshire	807.44	159.37	158.22	136	131	49	2,709	18,033,895	6,495,800	647,335	25,175,030	25,370,787	723.09	3,779,241	2,492,108	1,287,133	573,396	816,261
Vermont	836.06	129.37	296.00	175	125	54	3,721	19,531,600	18,516,900	791,888	38,840,388	34,680,521	880.02	4,124,462	3,320,126	794,736	466,961	202,781
Massachusetts	2,249.70	1,418.00	1,492.71	964	1,295	376	30,609	97,732,514	59,021,300	11,740,408	168,494,222	167,844,510	2,452.12	29,433,217	21,003,496	8,429,721	3,580,714	4,317,951
Rhode Island	153.07	70.54	103.50	44	55	18	400	4,766,457	2,879,500	210,016	7,355,953	6,736,799	146.82	1,354,363	827,212	526,151	148,378	253,186
Connecticut	931.01	322.88	702.50	322	388	145	5,330	34,606,350	8,988,378	2,510,657	46,104,385	45,994,198	1,031.10	9,948,388	6,385,693	3,562,695	607,456	2,835,571
New England	6,161.40	2,307.65	3,212.58	1,633	2,111	745	35,233	192,450,288	116,143,178	16,662,422	325,255,888	321,074,026	6,261.58	52,880,809	36,964,436	15,916,373	6,129,371	8,393,030
New York	5,981.27	4,429.11	4,567.12	2,121	2,376	478	58,633	358,486,795	229,628,431	14,608,520	602,723,747	559,921,240	6,130.58	80,452,327	51,566,936	28,885,391	12,559,238	11,142,779
New Jersey	1,965.22	1,893.52	1,322.81	755	1,001	180	38,123	90,878,216	116,956,653	6,233,440	214,068,349	168,218,355	2,020.87	31,245,862	20,335,891	11,509,911	6,596,398	3,250,864
Pennsylvania	6,748.28	4,981.97	5,187.30	2,461	3,815	431	147,721	371,227,011	374,271,947	34,454,687	780,053,645	585,424,686	6,381.78	101,015,882	62,214,185	38,796,697	21,248,307	17,166,731
Delaware	246.88	28.96	22.25	9	11	3	114	2,784,940	1,520,000	74,559	4,379,799	4,350,260	204.19	593,409	416,023	177,386	78,500	88,136
Maryland	1,146.06	599.64	917.00	661	876	138	18,297	41,259,068	41,960,329	2,918,464	89,137,888	83,571,024	1,243.23	13,652,963	8,303,168	5,349,795	2,805,298	1,663,805
West Virginia	227.46	44.24	116.02	9	6	3	55	8,149,585	5,942,134	283,282	14,375,007	14,963,945	229.46	842,838	699,314	143,524	216,050	3,279
Middle States	15,983.72	10,787.44	12,127.50	6,045	8,585	1,256	302,942	872,885,645	773,279,544	58,573,293	1,704,738,482	1,416,450,210	16,213.11	228,398,221	143,535,517	84,862,704	43,303,731	33,315,581
Virginia	2,505.78	324.36	1,504.76	440	207	127	8,759	71,069,472	70,957,008	5,973,696	147,992,176	142,891,043	1,804.01	10,58 ,743	6,926,638	3,654,105	1,738,054	196,454
North Carolina	1,615.24	101.64	108.41	139	98	46	1,898	21,032,100	13,647,150	1,556,911	36,236,161	30,492,940	1,430.39	3,778,916	2,525,416	1,253,530	468,451	372,138
South Carolina	1,347.68	96.33	197.55	129	91	34	1,613	16,667,540	20,880,332	1,819,992	39,367,554	36,740,932	1,236.65	4,007,354	2,719,172	1,288,182	374,989	
Georgia	2,621.84	241.75	748.85	381	222	118	5,673	34,586,015	19,333,700	1,299,770	55,219,489	55,408,478	2,523.34	9,441,326	5,709,975	3,731,351	881,060	1,025,958
Florida	775.10	38.55	22.01	59	71	21	1,097	9,601,790	4,307,000	722,319	14,631,109	11,447,530	134.09	4,3,6,0	275,273	158,397	111,808	6,600
Alabama	2,296.95	198.72	535.44	240	142	69	4,619	34,807,396	47,054,080	3,792,769	85,654,247	84,424,295	1,957.75	8,115,435	5,684,292	2,433,163	2,052,829	110,793
Mississippi	458.93	24.65	31.62	46	38	18	487	8,454 493	7,801,969	281,088	16,537,555	14,948,560	303.43	1,168,515	766,887	401,628	277,321	
Louisiana	1,585 61	176.43	919.06	212	169	42	4,423	32,370,000	42,650,000	2,131,719	77,151,719	74,330,516	1,213.61	9,783,311	6,937,439	2,845,872	1,904,490	64,000
Tennessee	1,904.31	418.58	693.14	282	182	77	5,887	53,475,613	59,191,000	2,580,650	115,247,263	114,785,774	1,493 8	6,709,631	4,536,903	2,172,728	1,108,805	513,075
Kentucky	2,893.08	377.78	998.14	494	278	114	13,580	41,336,693	59,170,640	3,573,373	104,080,079	107,004,567	1,735.40	9,718,106	5,116,439	4,301,667	2,229,170	1,302,253
Southern States	18,004.49	1,960.79	5,688.48	2,428	1,498	666	47,124	323,390,496	374,992,569	23,734,287	722,117,352	672,474,545	14,002.49	63,737,087	41,496,464	22,240,623	11,146,877	3,593,269
Ohio	7,890.15	2,328.76	4,419.82	2,232	1,134	502	78,46	367,416,295	330,429,734	17,067,284	714,913,263	610,728,103	7,469.80	65,530,099	41,115,857	24,414,242	9,652,737	6,222,680
Michigan	4,073.44	1,205.22	2,096 20	637	394	156	17,693	81,130,690	74,207,855	7,167, 02	162,506,247	166,190,901	3,490.00	20,238,466	13,841,215	6,452,251	3,894,372	2,479,376
Indiana	5,965.90	1,612.21	2,566.89	1,139	547	286	34,024	133,920,577	134,227,416	9,936,973	277,854,966	263,431,879	5,959.90	34,143,192	26,064,189	8,081,003	5,340,143	1,779,036
Illinois	10,684.91	2,980.56	5,547.12	2,117	1,004	453	69,404	274,401,262	223,725,062	15,150,921	513,277,205	500,4 9,772	11,856.94	89,348,867	48,723,927	40,624,880	10,867,258	13,966,218
Wisconsin	5,303.48	557.91	1,375.00	627	295	153	20,106	85,816,244	111,073,000	3,903,598	199,893,842	174,198,117	4,911.35	19,337,167	11,553,805	7,783,334	4,550,847	1,980,192
Minnesota	3,972.62	280.86	1,813.92	415	201	86	11,640	152,839,131	64,092,675	8,319,841	235,251,147	213,379,999	2 844.37	12,445,50	7,651,056	4,794,447	3,165,387	752,757
Dakota Territory	52.50	2.63	.....	5	3	2	100	1,000,000	930,000	160,000	2,090,000	2,090,000	.....	.....	.....	.....	.....	.....
Iowa	2,299 15	225.30	462.55	151	64	38	4,43.	50,768,870	33,779,120	4,197,897	88,745,887	74,0 0,139	1,732.64	6,360,63	4,075,936	2,284,724	1,456,274	555,953
Nebraska	2,013.10	342.50	1,291.00	438	282	112	8,996	66,731,500	137,372,034	4,035,078	208,138,612	172,057,6.6	2,134.90	15,302,836	13,582,916	11,719,921	4,819,128	4,076,134
Wyoming Territory	68.60	.....	.....	.....	.....	.....	.....	130,000	1,500,000	.....	1,630,000	1,630,00	.....	.....	.....	28,628	.....	26,000
Missouri	4,549 10	519.81	2,077 95	643	307	141	18,306	149,358,457	132,223,457	12,671,697	294,253,581	239,330,102	4,320.30	2,146,79.	15,957,419	13,429,373	7,335,625	2,299,977
Kansas	3,506.51	257.94	1,151.55	344	196	90	11,678	104,664,845	55,748,800	8,407,047	168,820,692	123,997. 11	3,296.87	17,045,837	10,706,537	6,3 9,290	2,937,062	2,674,647
Colorado	2,067.83	120.46	86 .55	170	87	47	4,365	30,392,300	31,129,479	4,221,386	65,743,162	71,139,659	1,397.54	9,135,54	5,580,728	3,554,816	1,595,631	1,621,764
Arkansas	660.95	38 90	1.00	49	47	17	1,014	14,340,300	12,038,917	1,561,771	27,940,967	21,651,284	432.01	1,709,299	1,107,484	601,815	432,215	
Texas	5,144.15	197.75	1,356.51	437	243	106	10,921	64,949,706	89,988,857	4,855,908	159,772,531	142,654,627	3,187.94	14,482,644	9,704,905	4,577,739	3,898,235	
Western and S. W. States, etc	58,226.99	10,580.90	25,623.06	9,433	4,802	2,186	291,963	1,577,910,186	1,432,479,393	100,456,353	3,120,843,932	2,771,109,312	52,974.58	344,393,806	209,685,941	134,756,493	59,844,556	40,284,829
New Mexico Territory	512.22	15.00	200.00	44	.....	.....	651	26,479,800	24,680,000	125,900	51,285,700	29,238,600	.....	.....	.....	242,228	106,780	.....
Arizona Territory	384.17	17.70	344.17	60	38	12	609	19,995,000	9,604,000	288,370	29,887,370	29,599,621	.....	.....	.....	622,355	576,240	.....
Utah Territory	976.51	31.00	160.08	32	9	4	377	13,136,860	14,550,000	469,232	28,156,092	21,802,259	732.54	2,663,021	1,307,926	1,356,095	643,205	261,750
Nevada	443.45	69.5	317.00	35	18	11	1,002	8,500,000	4,941,000	141,674	19,432,674	16,570,715	422.20	2,031,023	972,305	883,918	182,750	505,000
California	2,871.3	395.23	1,299.89	347	448	102	7,086	129,89 ,881	126,963,680	11,365,801	268,222,362	259,883,598	3,121 9	26,927,218	13,085,196	13,842,022	5,909,792	4,156,652
Oregon	780.70	51.86	50.00	59	39	14	1,3.9	31,000,000	12,911,000	948,935	44,759,935	29,794,045	757.70	4,518,734	2,537,266	1,981,448	714,000	2,264,089
Pacific States, etc	5,948.35	574.29	2,411.06	577	552	143	11,033	228,911,541	193,832,680	13,339,912	441,744,133	396,888,838	5,034.39	35,915,196	17,902,713	18,878,066	8,162,767	7,787,491

RECAPITULATION OF GEOGRAPHICAL GROUPS.

New England States	6,161.40	2,3 7.65	3,212.58	1,633	2,111	745	35,233	192,450,288	116, 43,178	16,662,429	325,255,888	321,074,026	6,261.58	52,880,809	36,964,436	15,916,373	6,129,371	8,393,030
Middle States	15,983.72	10,787.44	12,127.50	6,045	5,585	1,256	262,942	872,885,645	773,279,544	58,573,293	1,704,738,48	1,416,450,210	16,213.11	228,398,221	143,535,517	84,862,704	44,303,731	33,315,581
Southern States	18,004.49	1,960.79	5,688.48	2,428	1,498	666	47,124	323,390,496	374,992,569	23,734,287	722,117,352	672,474,545	14,002.49	63,737,087	41,496,464	22,240,623	11,146,877	3,593,269
W. & S. W. States, etc.	58,226.99	10,58 90	25,623.06	9,433	4,802	2,186	291,963	1,577,910,186	1,432,479,393	100,456,353	3,120,843,932	2,771,109,312	52,974.58	344,393,806	209,685,941	134,756,593	59,841,556	40,254,8 9
Pacific States, etc	5,948.35	574.29	2,411.06	577	552	143	11,033	228,911,541	193,832,680	13,339,912	441,744,133	396,888,838	5,034.39	35,915,196	17,902,713	18,878,066	8,162,767	7,787,491
United States	104,324.95	23,211.02	49,062.6	20,116	14,548	4,976	618,295	5,195,438,156	2,890,497,364	212,766,267	6,314,699,787	5,577,906,931	94,486.15	725,325,119	449,565,071	276,654,159	128,587,302	93,344,290

In the above table the length of the line given in the first column represents the total number of miles of the several companies which are domiciled in the state wherein appear their capital and operating accounts. The average length of road operated represents the number of miles of road upon which earnings are reported.

and and the different Eastern ports, is now in New York, preparing its report. It will be remembered that the trunk lines did not bind themselves to accept the award of this Commission; that is, it does not arbitrate, but, as its name implies, simply advises. If they do not accept, however, the arrangements they have made for dividing through freight fall through, and it is probable that they will accept the recommendations of the Commission if they do not make a considerable change from the present differences. At least, the companies seem strongly inclined to keep the peace, and will hesitate long before doing anything which will make still smaller their present very small profits from through freight.

JUNE EARNINGS so far reported are in the aggregate a little less this year than last, though the roads reporting have had an increase of 13½ per cent. in mileage. The average earnings per mile of these roads decreased from $565 to $495, or about 12½ per cent. June was a month of extraordinary receipts, for nearly all Northwestern roads last year, however, and part of the decrease is due to the unusually large returns then.

THE DIVISION OF CHICAGO SHIPMENTS EASTWARD is to be determined by the Arbitrator, Mr. Adams. Appeal was made from Mr. Fink's award, and arguments will be heard by the Arbitrator before the end of this month.

United States Railroads in 1881.

From the introduction to the issue of Poor's Manual for 1882, which will be published in a few days, we take the following:

The year 1881 has been one of extraordinary activity in railroad affairs. Within the year 9,358 miles of railroad have been built, the greatest number for any one year. The greatest mileage for any previous year was 7,379 miles, in 1871. The cost, at $25,000 per mile, of the lines constructed during the year was $233,750,000. In addition, at least $75,000,000 were expended on lines in progress, and $100,000,000, which is at the rate of only $1,000 per mile, on old roads, in improving their tracks, in building new stations and adding to their equipments. The total amount expended in construction during the past year was, in round numbers, $400,000,000. It now seems probable that the mileage to be open in 1882 will equal that for 1881. Up to the 1st of June, 1882, 3,677 miles of line were opened, against 1,724 for the same period in 1881. The same rate of increase will not be maintained for the remainder of the year, but the aggregate for it of new mileage is not likely to be much short of 10,000 miles.

* * * * * *

The earnings of all the roads in operation in the country, the past year, equalled $725,325,119, being an increase over the previous year of $110,000,000—the rate of increase being nearly 16 per cent. The earnings equalled $13.60 per head of our population. Their net earnings were $270,654,119, an increase of $21,500,000 over those of 1880. Their current expenses were $449,565,071. The amount of interest paid during the year on their funded debts was $128,887,002; the amount paid in dividends was $93,344,200, against $77,115,411 in 1880.

The cost of operating our railroads for the year was $449,565,071, or 62 per cent. of their gross earnings. The total amount expended in the construction of new lines and in operating and improving the old ones was over $750,000,000—the greater part of this vast sum being paid in wages. The number of persons employed in operating them the past year averaged fully 12 to the mile of operating lines, or 1,200,000 in all.* The number employed in the construction of our railroads equalled $400,000, increasing the total number of employés to 1,000,000, or about one thirty-second part of our population, estimated at 58,200,000.

Statement showing the number of miles of railroad constructed and in operation each year in the United States, from 1830 to the close of 1880, inclusive:

Year.	Miles in operation.	Annual increase.	Year.	Miles in operation.	Annual increase.	Year.	Miles in operation.	Annual increase.
1830	23	....	1848	5,996	398	1866	36,801	1,742
1831	95	72	1849	7,365	1,369	1867	39,250	3,449
1832	229	134	1850	9,021	1,656	1868	42,229	2,979
1833	380	151	1851	10,982	1,961	1869	46,844	4,615
1834	633	253	1852	12,908	1,926	1870	52,914	6,070
1835	1,098	465	1853	15,360	2,452	1871	60,283	7,379
1836	1,273	175	1854	16,720	1,360	1872	66,171	5,878
1837	1,497	224	1855	18,374	1,654	1873	70,278	4,107
1838	1,913	416	1856	22,016	3,647	1874	72,383	2,105
1839	2,302	389	1857	24,503	2,047	1875	74,096	1,712
1840	2,818	516	1858	26,968	2,465	1876	76,808	2,712
1841	3,535	717	1859	28,789	1,821	1877	79,089	2,281
1842	4,026	491	1860	30,635	1,846	1878	81,776	2,687
1843	4,185	159	1861	31,286	651	1879	86,427	4,721
1844	4,377	192	1862	32,120	834	1880	93,671	7,174
1845	4,633	256	1863	33,170	1,050	1881	104,813	11,142
1846	4,930	297	1864	33,908	738			
1847	5,598	668	1865	35,085	1,177			

The increase of mileage over that of last year exceeds the number of miles elsewhere stated as constructed during the year (9,358 miles). This is owing to reports having been received from some lines previously constructed, the reports for which were obtained this year for the first time.

Statement of miles operated, of which earnings are reported, with capital stock and funded debt, gross earnings, net earnings, freight earnings, passenger earnings, and dividends paid for ten years:

Year.	Miles operated.	Capital and funded debt.	Gross earnings.	Net earnings.
1881	94,486	$5,010,389,579	$725,325,119	$276,654,119
1880	84,225	4,897,401,997	615,401,931	255,193,436
1879	82,223	4,762,506,010	529,012,999	219,916,724
1878	78,960	4,589,948,793	490,103,351	187,575,167
1877	74,112	4,568,597,248	472,909,272	170,976,697
1876	73,508	4,468,591,935	497,267,959	186,452,752
1875	71,759	4,415,631,630	503,065,505	185,506,438
1874	69,273	4,221,763,594	520,466,016	189,570,958
1873	66,277	3,784,543,034	526,419,945	183,810,562
1872	57,323	3,159,423,057	465,241,055	165,754,373

*This is not possible. The average on the New York Central in the year 1879-80 was but 13 per mile of road, 5.2 per mile of track, and 20.6 per locomotive, and its traffic is at least three or four times as great as the average; with the same number of employés *per mile of track*, the railroads of the United States in 1881 employed about 650,000 men, or 6¼ per mile of road; and this we believe to be too large an estimate. Witness such a great road as the Chicago, Rock Island & Pacific, with just 6¼ men per mile, and certainly much more than the average traffic per mile; while the Chicago & Northwestern has a considerably smaller force per mile.—EDITOR RAILROAD GAZETTE.

Year.	Miles operated.	Freight earnings.	Passenger earnings.	Dividends paid.
1881	94,486	$551,968,477	$173,356,642	$93,344,200
1880	84,225	467,748,928	147,653,003	77,115,411
1879	82,223	386,676,108	142,336,191	61,181,470
1878	78,960	365,466,061	124,637,290	53,629,368
1877	74,112	347,704,548	125,204,724	58,556,312
1876	73,508	361,137,376	136,120, 83	68,039,668
1875	71,759	363,960,234	139,105,271	74,294,208
1874	69,273	379,466,935	140,999,081	67,042,942
1873	66,237	389,035,508	137,384,427	67,120,709
1872	57,323	340,931,785	132,309,270	54,418,157

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings will be held as follows:

Memphis & Charleston, adjourned special meeting, in Huntsville, Ala., Aug. 22.

Dividends.

Dividends have been declared as follows:

East Pennsylvania (leased to Philadelphia & Reading) 3 per cent., semi-annual, payable July 18.

Little Schuylkill, 3½ per cent., semi-annual, payable July 14.

Atchison, Topeka & Santa Fe, 1½ per cent., quarterly, payable Aug. 15. Transfer books close July 15.

American Institute of Mining Engineers.

A circular from R. P. Rothwell, President, and T. M. Drown, Secretary, gives the following programme and other information in relation to the Colorado meeting of the Institute next month:

Saturday, Aug. 19.—In Denver. A brief preliminary evening meeting at which the Institute will be received by the citizens of Denver.

Monday, Aug. 21.—Visit to Black Hawk and Central, with an evening session at Central City.

Tuesday, Aug. 22.—Georgetown, Idaho Springs. Return to Denver in the evening.

Wednesday, Aug. 23.—Leadville, going over the South Park Railroad. Evening session.

Thursday, Aug. 24.—Excursions to the Leadville mines.

Friday, Aug. 25.—Excursions to the Leadville smelting works, reaching Pueblo at night.

Saturday, Aug. 26.—Pueblo Iron & Steel Works, and Mather & Geist's Smelting Works. Colorado Springs and Manitou in the evening.

Sunday, Aug. 27.—Colorado Springs and Manitou.

Monday, Aug. 28.—Return to Denver. Evening reception.

Tuesday, Aug. 29.—Argo Smelting Works. Golden and its smelting works. Subscription dinner.

Besides these excursions, facilities will be afforded those who desire to see the iron and coal mines of Colorado. And for those who can extend their visit, an excursion to the San Juan district will be organized.

Arrangements are being made with the railroad companies for reduced rates to members of the Institute and ladies accompanying them. When concluded, a circular will be issued informing members of the expenses from different points to Denver and return. These rates will probably not exceed two-thirds the regular rates, or about $60, plus Pullman car special rates, from New York to Denver and return. Special facilities are courteously offered by the roads in Colorado for the excursions of the Institute.

Persons proposed for membership have the same privi-

leges as members with regard to the meeting and excursions.

As usual at the meetings of the Institute, ladies are expected to be present; 77 members with 43 ladies have already signified their intention of being present at the Colorado meeting, and it is expected that the attendance will greatly exceed these numbers.

The unusual attractions offered by the mining regions of Colorado are increased at this time by those of the Denver Exposition of mining appliances, minerals, etc., and by the unusual facilities offered for examining mines and works, and acquiring information concerning them.

The representatives of several foreign kindred societies are expected to be present.

Members who purpose attending this most interesting meeting should at once write the Secretary of the Institute (Prof. T. M. Drown, Easton, Pa.), who has to notify the railroad companies of the number of tickets required, and the names of those entitled to the special rates offered. They are also requested to inform the Secretary promptly of their intention to read papers at the meeting.

Prof. W. I. Marshall, who is well-known by his lectures on the wonders of the Geyser Country, offers to conduct a party of not less than eight, nor more than 25, through the Yellowstone National Park. This trip would occupy 26 to 29 days from Denver to and through the Park and back to Denver. The greater part of this time would be spent camping out in the Park. The expenses of this round trip are estimated at from $275 to $300 for each person. Full information concerning this trip may be obtained from Prof. W. I. Marshall, Fitchburg, Mass.

The local committee in charge of arrangements for the meeting consists of Richard Pearce, Chairman; A. Eilers, L. C. Ellsworth, W. S. Cheesman, George W. Young, H. Silver, John Pierce, E. W. Rollins, H. Beeger, S. F. Emmons and H. R. Wolcott.

ELECTIONS AND APPOINTMENTS.

California Short Line.—This company has been organized with the following directors: J. E. Bamberger, A. G. Campbell, W. W. Chisholm, George A. Lowe, John T. Lynch, W. S. McCornick, Eli H. Murray. The board has elected Gov. Eli H. Murray President; A. G. Campbell, Vice-President; F. K. Morris, Secretary; W. S. McCornick, Treasurer; F. C. Hand, Chief Engineer. Office in Salt Lake, Utah.

Camden, Gloucester & Mt. Ephraim.—This company has re-elected James P. Michellon President; Frederick P. Pfeiffer, Secretary and Treasurer.

Chicago, Burlington & Quincy.—The board has elected Henry W. Weiss Secretary in place of Amos T. Hall, deceased. Mr. Weiss has been Assistant Secretary for a number of years.

Cincinnati & Eastern.—At the annual meeting last week the following directors were chosen: J. P. Duckwall, N. W. Evans, O. H. Hardin, J. W. Henley, M. Jamieson, W. R. McGill, Wm. Mansfield, W. J. Marshall, J. M. Neely, F. M. Smith, N. R. Thomson, G. H. Wilbur. The board elected W. R. McGill President; Wm. Mansfield, Secretary; M. Jamieson, Treasurer; G. H. Wilbur, Superintendent.

Cincinnati, Hamilton & Dayton.—The following appointments on this road are announced: Superintendent of Telegraph, C. A. Darlton, Cincinnati; Superintendent of Bridges and Buildings, Henry Golden, Hamilton, O.; Road-Master, Cincinnati, Hamilton & Dayton, Cincinnati, Richmond & Chicago and Cincinnati, Hamilton & Indianapolis divisions, Richard Brennan, Hamilton, O.; Road-Master, Dayton & Michigan Division, Joseph Taubken, Lima, Ohio.

Denver Circle.—Mr. C. M. Kendall is Superintendent and Chief Engineer, with office in Denver, Col.

Kankakee Valley.—The directors of this new company are: A. S. Baker, J. Stanfield, C. Studebaker, J. M. Studebaker, South Bend, Ind.; W. B. Biddle, G. Gleason, M. N. Nye, E. H. Scott, La Porte, Ind.; Thomas J. Wood, Crown Point, Ind.; W. E. Renney, Valparaiso, Ind.; E. Lamphere, W. F. Singleton, Chicago: G. W. Cass, New York.

Kentucky Central.—The following circular from President Ingalls is dated July 1:

"On and after to-day the organization of the company will be as follows: The office of General Manager is abolished.

"Mr. J. H. Setchel will have charge of all shops, maintenance of way and transportation, with title of Superintendent.

"Mr. C. L. Brown will have charge of all freight and passenger traffic, with title of General Freight and Passenger Agent.

"Mr. C. H. Bronson of all accounts and monies as Treasurer.

"Mr. G. W. Bender will issue all passes, except to employés on company's service, purchase all supplies, sign all vouchers and do the general work of the board of directors, with title of Secretary. He is also appointed Assistant to the President, and will have such duties as may be from time to time assigned him."

Louisville & Nashville.—Mr. Milton H. Smith has been chosen First Vice-President in place of Gen. E. P. Alexander, resigned. Mr. Smith was for some years General Freight Agent and afterwards Traffic Manager, and left the road to become General Freight Agent of the Baltimore & Ohio. From that road he went to the Pennsylvania as General Agent for New York and New England, and returned to the Louisville & Nashville a few months ago as Third Vice-President and Traffic Manager.

Manhattan Elevated.—The board has elected Jose F. de Navarro a director in place of W. R. Garrison, deceased.

Meriden & Cromwell.—This company has been organized at Meriden, Conn., with the following officers: President, H. C. Wilcox; Vice-President, Charles Parker; Secretary, C. L. Rockwell; Treasurer, A. Chamberlain; Auditor, O. B. Arnold; Executive Committee, H. C. Wilcox, D. N. Parker, N. L. Bradley, Samuel Dodd and G. W. Lyon.

Nebraska, Topeka, Iola & Memphis.—Mr. H. M. Clark is General Manager, and Mr. C. G. Waite, Chief Engineer. Office at Girard, Kansas.

New York, Chicago & St. Louis.—Mr. Henry Monett is appointed General Passenger Agent of this company, with headquarters at Cleveland, O.; appointment to date from July 1. Mr. Monett was formerly on the Pittsburgh, Cincinnati & St. Louis, and is known as an active and capable passenger man.

New York Loan and Improvement Co.—At the annual meeting in New York, July 11, the following directors were chosen: Jose F. de Navarro, George J. Forrest, A. M. Billings, A. V. Stout, Arthur Leary, John J. McCrook, Fausto Mora, H. F. Dimock, Robert C. Livingston.

North Shore.—The Board has elected Mr. M. Davis General Manager, relieving Mr. L. A. Senecal, who continues President. The board has also elected W. E. Blumhart Secretary.

Portsmouth, Great Falls & Conway.—At the annual meeting in Portsmouth, N. H., July 11, the following directors were chosen: John Cumnock, George E. B. Jackson, S. C. Lawrence, E. B. Phillips, Willard P. Phillips. The road is leased to the Eastern Company.

Sinaloa & Durango.—Mr. Edward P. North, late Chief Engineer, has been chosen Vice-President and General Manager. His office will be at No. 18 Wall street, New York.

Texas-Mexican.—At the adjourned annual meeting in Corpus Christi, Tex., July 1, the following directors were chosen: G. Clinton Gardner, Charles S. Hinchman, M. Kenedy, T. F. H. Meyer, D. M. Murphy, W. J. Palmer, B. W. Thacher. The board elected W. J. Palmer, President; M. Kenedy, First Vice-President; Charles S. Hinchman, Second Vice-President; D. M. Murphy, Assistant Secretary; T. F. H. Meyer, Charles S. Hinchman, Executive Committee.

PERSONAL.

—Mr. Henry D. Farnandis has declined the position of President of the Chesapeake & Ohio Canal Company, to which he was lately elected.

—Mr. O. J. Healy, Chief Train Dispatcher of the International & Great Northern road, was shot and killed at Palestine, Tex., July 11, by a conductor named Cook, whom he would not allow to take out a train. Cook escaped.

—Mr. Wm. Gooderham, late President of the Toronto & Nipissing Company, was recently presented with a portrait of himself and a complimentary address, on the occasion of his retiring from the management, by the officers and employés of the road.

—It is reported that Mr. W. J. Brokaw, now Master Mechanic of the Construction Department of the Eastern Division of the Northern Pacific road, has been offered and will accept the position of Master Mechanic of the Denver & Rio Grande Western road, with office at Salt Lake.

—Mr. Alexander L. Massey, a well-known engineer of Philadelphia, died in London, England, June 30, aged 58 years. Mr. Massey was President of the Bell's Gap Railroad Company, the Penn Gas Coal Company, the Youghiogheny Coal Company and the Millwood Coal & Coke Company.

—Mr. Harrison Bliss, for many years a merchant, and one of the richest men in Worcester, Mass., died in that city July 7, aged 69 years. He was at one time president of the old New Bedford & Taunton, and vice-president of the Framingham & Lowell Company. He was interested in the Boston, Clinton, Fitchburg & New Bedford and some other roads.

—The resignation of Gen. E. P. Alexander as First Vice-President of the Louisville & Nashville Company has finally been accepted, the board, in taking this action, expressing deep regret. Gen. Alexander is widely and favorably known among Southern railroad men; he served as General Manager of the Western, of Alabama, and President of the Georgia Railroad Company, before going to the Louisville & Nashville.

—Dr. R. W. Raymond, Mr. J. C. Bayles and Mr. Charles Macdonald, representing a joint committee of the American Society of Civil Engineers, the American Institute of Mining Engineers and the American Institute of Mechanical Engineers, have issued a circular, announcing that it is proposed to erect in the Central Park, New York, a monument to Alexander Holley. This monument, which is to consist of a suitable pedestal in stone, with architectural and symbolic decoration, surmounted by a portrait-bust in bronze, will, it is estimated, cost about $10,000. Mr. Charles Macdonald, Treasurer, of 52 Wall street, will receive subscriptions, which will be periodically acknowledged.

TRAFFIC AND EARNINGS.

Grain Movement.

For the week ending July 1 receipts and shipments of grain of all kinds at the eight reporting Northwestern markets and receipts at the seven Atlantic ports have been, in bushels, for the past six years:

Year.	Northwestern receipts.	—Northwestern shipments.— Total.	By rail.	P. c. by rail.	Atlantic receipts.
1877....	1,939,151	2,416,415	557,394	23.1	2,060,484
1878....	3,006,566	3,059,500	826,301	27.0	3,062,715
1879....	3,779,676	3,829,431	1,236,651	32.3	3,457,237
1880....	5,117,800	6,025,682	1,709,241	28.4	8,192,047
1881....	7,649,571	6,259,673	2,542,753	40.6	7,169,106
1882 ...	2,310,613	2,481,797	727,259	29.3	2,939,877

The receipts, the total shipments and the rail shipments of the Northwestern markets for the week are all smaller than in the corresponding week of any previous year since 1877, and the receipts of the Atlantic ports are the smallest since 1873, at least. Compared with previous weeks of this year the Northwestern receipts are the smallest since navigation opened, the Northwestern shipments are a quarter less than the week before and the smallest for five weeks, the rail shipments are 36 per cent. less than the week before and are the smallest since November, 1879.

The Atlantic receipts, however, were 300,000 bushels more than the week before, and with the exception of the first week of May, are the largest of this year, though nearly 60 per cent. less than in the corresponding week of last year.

Of the Northwestern receipts this year, Chicago had 47 per cent., St. Louis 15.9, Milwaukee 11.9, Peoria 8.6, Toledo 7.7, Detroit 6.9, Cleveland 1.5, and Duluth 0.5 per cent.

Of the Atlantic receipts, New York had 63.8 per cent., Philadelphia 12.2, Baltimore 7.5, Boston 6.3, Montreal 5.4, New Orleans 4.5, and Portland 0.3 per cent.

Exports from Atlantic ports, for the week ending July 5, were 1,098,713 bushels of grain and 52,678 barrels of flour, against 3,773,376 bushels of grain and 63,348 barrels of flour in the corresponding week of last year.

Receipts and shipments at Buffalo for this week ending July 8 were:

	—Receipts.— 1882.	1881.	—Shipments.— 1882.	1881.
By rail.....	315,500	637,900	464,150	1,556,400
By water.....	1,130,000	2,073,000	568,000	1,248,000
Total.....	1,445,500	2,710,900	1,032,150	2,804,400

The decrease in receipts by lake is almost as large in proportion as that in the rail receipts, though rail rates were 80 per cent. higher this year and lake rates not half as high as last year. The decrease in rail shipments, however, was 70 per cent., and in canal shipments but 55 per cent.

For this week ending July 8, receipts at four Eastern points were:

Bushels:	New York.	Boston.	Phila.	Baltimore.	Total.
1882	1,309,968	252,722	78,250	151,837	1,792,777
1881.....	3,312,477	440,892	625,000	862,566	5,240,935
1880.....	3,856,969	689,330	393,300	998,168	5,937,767
P. c. of total:					
1882.....	73.0	14.1	4.4	8.5	100.0
1881.....	63.2	8.4	11.9	16.5	100.0
1880.....	65.0	11.6	6.6	16.8	100.0

Philadelphia and Baltimore together received 12.9 per cent. of the whole this year, against 28.4 last year and 23.4 in 1880.

For the week ending July 8 receipts and shipments at Chicago and Milwaukee were:

	—Receipts.— 1882.	1881.	—Shipments.— 1882.	1881.
Chicago.....	805,290	2,882,336	1,230,998	2,680,425
Milwaukee.....	196,760	278,562	173,414	454,918
Both	1,002,050	3,160,898	1,404,412	3,135,343

The receipts this year are but 31.7 per cent. and the shipments but 44.8 per cent. those of last year.

Railroad Earnings.

Earnings for various periods are reported as follows:

	1882.	1881.	Inc. or Dec.		P.c.
Six months ending June 30:					
Atch., Top. & S. F.	$6,800,718	$5,396,206	I.	$1,404,512	26.0
Bur., C. Rap. & No.	1,291,399	997,032	I.	294,367	29.5
Central Iowa.....	546,171	390,456	I.	155,715	39.9
Central Pacific.....	12,176,568	10,889,924	I.	1,286,644	11.8
Chi. & Alton.....	3,424,584	3,245,958	I.	178,626	5.5
Chi. & Eastern Ill..	814,510	760,457	I.	54,053	7.1
Chi., Mil. & St. P...	9,140,000	7,118,801	I.	2,021,199	28.4
Chi. & Northwest'n	10,504,499	9,042,724	I.	1,461,775	16.2
Chi., St. P., M. & O..	2,217,433	1,683,927	I.	533,506	31.7
Cleve., Ak. & Col...	235,461	203,317	I.	32,144	15.8
Grand Trunk..... ..	5,321,895	5,366,205	D.	44,310	0.8
Great Western.....	2,412,610	2,584,056	D.	171,446	6.6
Hann. & St. Jo.....	904,278	1,008,133	D.	103,855	10.3
Ill. Cent., Ill. lines..	3,203,330	3,065,375	I.	137,955	4.5
Iowa lines.....	905,425	787,833	I.	117,592	14.9
Ind., Bloom. & W....	1,152,435	1,146,645	I.	5,787	0.5
Louisv. & Nash.....	6,084,664	5,477,515	I.	607,149	11.1
Net earnings.....	2,528,200	2,010,706	I.	517,494	25.7
Mil., Lake Sh. & W.	407,543	239,467	I.	168,076	70.3
Mo. Pacific lines:					
Central Branch...	382,312	460,008	D.	77,696	16.9
Int. & Gt. No.	1,342,958	1,143,763	I.	199,195	17.4
Mo., Kan. & Tex..	2,647,327	2,295,323	I.	352,104	15.3
Mo. Pacific.....	3,215,579	3,033,224	I.	182,355	6.0
St. L., I. M. & So.	3,231,303	3,335,429	D.	104,126	3.1
Tex. & Pacific....	2,002,824	1,732,446	I.	330,378	19.1
Mobile & Ohio.....	887,727	1,117,899	D.	230,172	20.6
N. Y. & N. England.	1,533,171	1,240,998	I.	292,173	23.5
Norfolk & Western	1,020,217	995,129	I.	25,088	2.5
Northern Pacific....	2,586,041	1,299,234	I.	$1,286,300	98.9
Ohio Central.....	455,986	274,791	I.	181,195	65.9
Peoria, Dec. & Ev..	364,272	279,317	I.	84,955	30.4
St. L., A. & T. H.					
Main Line.....	580,720	716,245	D.	135,525	18.9
Belleville Line....	386,581	368,381	I.	18,200	4.9
St. P., Minn. & Man.	3,631,034	1,948,280	I.	1,682,754	86.4
Scioto Valley.....	234,262	164,963	I.	69,299	42.0
Tol., Cin. & St. L....	436,146	282,437	I.	153,709	54.5
Union Pacific.	13,099,000	10,964,000	I.	2,135,000	19.5
Wabash, St. L. & P..	7,411,248	6,227,266	I.	1,183,982	19.0
Wisconsin Central..	928,006	661,887	I.	266,119	40.2
Five months ending May 31:					
Cleve., Col., C. & Ind.	$1,479,312	$1,665,128	D.	$185,816	11.2
Kan. C., L. & So. K.	367,909	274,444	I.	93,465	34.0
N. Y., Pa. & Ohio .	2,179,759	2,282,709	D.	102,950	4.5
West Jersey... ..	320,322	284,853	I.	35,469	12.4
Net earnings..	129,992	106,327	I.	23,665	22.3
Month of April:					
St. John & Maine...	$15,670	$12,179	I.	$3,491	28.6
Net earnings.....	5,587	3,046	I.	2,541	84.7
Month of May:					
Cl., Col., Cin. & Ind.	$343,790	$357,129	D.	$13,339	3.7
Grand Trunk.....	£185,666	£180,717	I.	£7,949	4.4
Net earnings.....	58,178	61,164	D.	2,986	4.9
Great Western.....	72,740	78,596	D.	5,856	7.4
Net earnings.....	16,356	20,199	D.	3,843	19.1
K. City, L. & So. K.	$73,306	$57,487	I.	$15,879	27.0
M., Hought. & Ont..	178,224	70,977	I.	107,247	151.1
Net earnings.....	120,544	35,450	I.	85,084	239.6
N. Y., Pa. & Ohio...	440,099	470,369	D.	30,270	6.5
Month of June:					
Atch., To. & S. F...	$1,147,000	$1,197,550	D.	$50,550	4.2
Bur., C. Rap. & Mo.	211,257	205,912	I.	5,345	2.6
Central Iowa.....	100,629	89,918	I.	10,711	11.9
Central Pacific.....	2,239,000	2,159,381	I.	79,619	3.7
Chi. & Alton.....	613,886	635,860	D.	21,974	3.3
Chi. & East. Ill.....	132,615	144,879	D.	12,264	8.5
Chi. & Gd. Trk.....	146,004	115,581	I.	30,423	26.2
Chi., Mil. & St. P...	1,620,000	1,729,811	D.	109,811	6.3
Chi. & N'thwest'n..	2,022,700	2,306,440	D.	283,740	12.3
Ch., St. P. M. & O...	363,109	404,562	D.	41,453	10.2
Cleve., Ark. & Col...	43,171	35,484	I.	7,687	21.6
E. Tenn., Va. & Ga..	208,398	204,208	I.	4,190	2.1
Evansv'e & T. H....	59,100	55,039	I.	4,061	7.4
Han'l & St. Jo.....	155,030	190,740	D.	35,710	18.7
Ill. Cent., Ill. lines..	520,810	629,280	D.	108,470	17.2
Iowa lines.....	142,936	174,607	D.	31,671	18.1
Ind., Bl'm. & West .	186,133	199,846	D.	13,713	6.9
Lit. R'k & Ft. Sm...	27,138	28,058	D.	920	3.2
Louis. & Nash.....	1,187,385	1,227,885	D.	40,500	3.3
Mil., Lk Sh. & W...	69,568	47,731	I.	21,837	45.5
Mo. Pacific lines:					
Central Branch...	55,530	97,131	D.	41,601	43.0
Int. & Gt. No.....	237,294	172,004	I.	65,290	37.9
Mo., Kan. & Tex..	455,904	406,606	I.	49,298	12.1
Mo. Pacific.....	535,688	607,998	D.	72,310	11.9
St. L., I. Mo. & So.	529,700	474,302	I.	55,398	11.6
Tex. & Pac..	384,712	285,305	I.	99,407	34.9
Mobile & Ohio.....	132,572	130,517	D.	3,945	2.9
N. Y. & New Eng...	290,060	231,518	I.	58,542	25.2
Norfolk & West.....	170,102	156,888	I.	13,214	8.4
Northern Pacific.. .	631,342	412,024	I.	219,318	53.2
Ohio Central.....	82,665	60,506	I.	22,159	36.6
Ohio Southern.....	25,778	25,297	I.	481	1.9
Peoria, Dec. & Ev..	53,690	49,986	I.	3,704	7.4
St L., A. & T. H.,					
Main Line	91,351	121,996	D.	30,645	25.1
Belleville Line	51,391	50,132	I.	1,259	2.5
St. P., Minn. & Man.	856,417	405,321	I.	451,096	111.3
Scioto Valley.....	41,983	39,094	I.	2,889	7.4
Tol., Cin. & St. L....	67,647	52,404	I.	15,243	29.2
Union Pacific.	2,183,000	2,593,000	D.	410,000	15.8
Wab., St. L. & Pac..	1,149,682	1,308,992	D.	159,310	12.2
Wisconsin Central..	144,283	129,720	I.	14,563	11.2
First week in July:					
Denver & Rio Gr....	$113,406	$134,302	D.	$20,896	15.6
Chi., Mil. & St. P'l..	331,000	364,834	D.	33,834	9.3
Northern Pacific....	159,200	91,700	I.	67,440	73.4
Wab., St. L. & Pac.	254,907	237,020	I.	17,888	7.6

For a number of the figures given above, we are indebted to the *Commercial and Financial Chronicle's* courtesy.

Kentucky Grain Rates.

A dispatch from Cincinnati, July 11, says: "The Local Freight Agents' Association met at the office of the Union Line to-day for the purpose of fixing the rates on grain from Kentucky. Action has been made necessary from the fact that the Chesapeake & Ohio, with a 30-cent rate from Lexington to the sea-board, has contracts with large shippers covering July and August to pay a 2-cent rebate. This cut will, of course, have to be adjusted or met. The action of the Chesapeake & Ohio in this matter will cost that company and all its competitors many thousands of dollars, for the reason that the crop of wheat is so heavy that all the roads will have all they can do to move it, and a 30-cent rate could have easily been maintained had the roads stood together. The agents went over the whole subject, and after considerable consideration voted to refer the matter to the Pool Committee with a request that they report on Thursday. President Ingalls, of the Kentucky Central and of the Cincinnati, Indianapolis, St. Louis & Chicago lines, said to-day that the crops in the country, tributary to Cincinnati have never been excelled."

Coal Movement.

Anthracite tonnages for the six months ending July 1, are reported as follows, the tonnage in each case being only that originating on the line to which it is credited :

	1882.	1881.	Inc. or Dec.	P. c.
Phila & Reading	2,922,568	3,054,759 D.	132,191	4.3
Northern Central, Shamokin, Div., and Summit Br. R. R.	546,017	454,224 I.	91,793	27.2
Sunbury, Hazleton & Wilkesbarre	20,000	1,224 I.	18,776	
Pennsylvania Canal	173,287	164,724 I.	8,563	5.2
Central of N. J., Lehigh Div	2,089,619	2,050,069 I.	39,550	1.9
Lehigh Valley	2,683,322	2,584,660 I.	98,662	3.8
Pennsylvania & N. Y.	95,184	39,449 I.	55,735	141.1
Del. Lacka. & Western.	2,014,921	1,960,377 I.	54,544	2.8
Del. & Hudson Canal Co.	1,539,120	1,651,298 D.	112,178	6.8
Pennsylvania Coal Co.	581,205	585,883 D.	4,678	0.8
State Line & Sullivan	27,070	31,017 D.	3,947	12.7
Total anthracite	12,692,313	12,577,684 I.	114,629	0.9

The tonnage of anthracite for the corresponding period for six years has been :

1882	12,692,313	1879	12,033,998
1881	12,577,684	1878	7,212,665
1880	10,321,876	1877	9,915,120

The anthracite trade is steadier and prices are better maintained. Deliveries at present, however, are mainly on old orders.

Anthracite coal tonnage passing over the Belvidere Division, Pennsylvania Railroad, for the six months was as follows:

	1882.	1881.	Increase.	P. c.
Coal Port for shipment	32,575	23,583	8,992	37.5
S. Amboy for shipment	364,134	321,531	42,603	10.4
Local points on N. J. lines	349,111	346,101	3,010	0.9
Co.'s use on N. J. lines	63,792	52,669	11,123	21.0
Total	809,612	743,884	65,728	8.8

Of the total this year 646,594 tons were from the Lehigh Region, and 163,018 tons from the Wyoming Region.

Actual tonnage passing over the Pennsylvania & New York road for the seven months of the fiscal year from Dec. 1 to July 1 was:

	1882.	1881.	Inc. or Dec.	P. c.
Anthracite	591,846	548,038	I. 43,808	8.0
Bituminous	226,780	250,959	D. 24,179	9.6
Total	818,626	798,997	I. 19,629	2.5

The larger part of the anthracite comes from the Lehigh Valley road.

Semi-bituminous tonnages reported for the six months are as follows:

	1882.	1881.	Inc. or Dec.	P. c.
Cumberland, all lines	530,260	950,756	D. 420,496	44.2
Huntingdon & Broad Top.	134,581	111,033	I. 23,548	21.2
East Broad Top	46,041	35,916	I. 10,125	28.1
Tyrone & Clearfield	1,443,497	1,182,802	I. 260,695	22.0
Bellefonte & Snow Shoe	105,931	49,341	I. 56,590	114.7
Total semi-bituminous	2,260,310	2,329,848	D. 69,538	3.0

The Cumberland strike still continues, with very little change. Contrary to expectation, the Clearfield strike has become general, the men leaving work altogether, after a good deal of hesitation. It is not thought possible that an advance will be granted, as the contracts in this trade have been taken on such very small margins that an advance will more than wipe out all profits. Latest advices are that the strike will soon be over, the general stoppage lasting only a few days.

Actual tonnage passing over the Huntingdon & Broad Top road for the six months was:

	1882.	1881.	Inc. or Dec.	P. c.
Broad Top coal	134,581	111,033	I. 23,548	21.2
Cumberland coal	85,331	125,522	D. 40,191	31.9
Total	219,912	236,555	D. 16,643	7.0

The Broad Top coal is mined on the line; the Cumberland is carried through for the Pennsylvania Railroad.

Shipments of Cumberland coal away from the region for the six months were as follows:

	1882.	1881.	Decrease.	P. c.
Balt. & Ohio R. R.	328,147	630,616	302,469	47.9
Bedford Div., Pa. R. R.	74,842	110,043	35,201	32.0
Ches. & Ohio Canal	10,211	174,404	164,193	94.1
Total	413,200	915,963	501,863	54.8

Of the shipments from the mines this year 48,275 tons passed over the George's Creek & Cumberland road, against 23,311 tons last year, an increase of 24,964 tons, or 107.1 per cent.

Bituminous coal shipments reported for the six months were as follows :

	1882	1881.	Inc. or Dec.	P. c.
Barclay R. R. & Coal Co.	190,438	209,650 D.	19,212	9.1
Allegheny Region, Pa. R. R.	267,942	137,888 I.	130,054	93.4
Penn and Westmoreland	640,103	425,535 I.	214,568	50.4
West Penn. R. R.	178,522	159,288 I.	19,234	12.1
Southwest Penn. R. R.	30,805	15,221 I.	15,584	102.5
Pittsburgh Region, Pa. R. R.	356,181	315,452 I.	40,729	12.9
Total bituminous	1,663,991	1,263,034 I.	400,957	31.7

The Pittsburgh river trade has been large this year, owing to the generally high state of the Ohio River. The coal men have not been obliged to wait for a rise, but have continued to ship, and the markets down the river are generally well stocked.

Coke tonnages reported for the six months are as follows:

	1882.	1881.	Inc. or Dec.	P. c.
Bellefonte & Snow Shoe	12,217	4,012 I.	8,205	205.1
Allegheny Region, Pa. R. R.	56,131	50,530 I.	5,601	11.1
Penn and Westmoreland	131,909	101,418 I.	30,491	30.2
West Penn. R. R.	61,919	59,314 I.	2,605	4.4
Southwest Penn. R. R.	911,241	706,627 I.	204,614	29.0
Pittsburgh Region, Pa. R. R	333,920	315,166 I.	18,754	5.9
Total coke	1,507,337	1,237,067 I.	270,270	21.8

These tonnages are all over the Pennsylvania Railroad. The coke trade is beginning to feel the effects of the iron strike to some extent.

The coal tonnage of the Pennsylvania Railroad for the six months was as follows :

	1882.	1881.	Increase.	P. c.
Anthracite	765,175	635,744	129,431	20.3
Semi-bituminous	1,775,128	1,447,072	328,056	22.7
Bituminous	1,473,521	1,053,384	420,137	39.9
Coke	1,507,337	1,237,067	270,270	21.8
Total	5,521,161	4,373,267	1,147,894	26.2

The tonnage by months this year has been: January, 810,571; February, 823,788; March, 1,114,894; April, 844,630; May, 1,067,845; June, 859,433; total, 5,521,161 tons.

The coal tonnage of the Chesapeake & Ohio Railroad for the six months was as follows:

	1882.	1881.	Increase.	P. c.
Coal	404,543	369,306	35,237	9.6
Coke	46,260	37,373	8,887	23.7
Total	450,803	406,679	44,124	10.8

The tonnage in June was 72,277 tons, of which 28,642 tons were carried to Richmond and Newport News for shipment by water.

Coal receipts at Boston for the half-year were as follows:

	1882.	1881.	Inc. or Dec.	P. c.
Anthracite	771,530	541,483	I. 230,047	42.5
Bituminous	147,798	115,123	I. 32,675	28.4
English and Nova Scotia	56,044	60,553	D. 4,509	7.4
Total	975,372	717,159	I. 258,213	36.0

For the six months ending June 30 the Kansas City, Ft. Scott & Gulf road carried 152,599 tons of coal and 354 tons of coke directly from mines on the line; also, 667 tons of coal received from the St. Louis & San Francisco road.

For the six months the Tennessee Coal, Iron & Railroad Company carried from its mines in Tennessee 72,615 tons of coal and 52,833 tons of coke.

Cotton.

The following figures for the movement of cotton for the ten months of the crop year from Sept. 1, to June 30 are given by the *Commercial and FinancialChronicle*, in bales :

	1881-82.	1880-81.	Inc. or Dec.	P. c.
Receipts at ports	4,620,487	5,681,281 D.	1,060,794	18.7
Net shipments overland	464,336	509,799 D.	45,463	8.9
Total	5,084,823	6,191,080 D.	1,106,257	17.9
Southern consumption	229.000	195,000 I.	34,000	17.4
Total bales	5,313,823	6,386,080 D.	1,072,257	16.8

The net shipments overland are obtained by deducting from the shipments reported from inland points, all which subsequently appear again in receipts at ports.

Besides the decrease in number of bales, there has been a decrease in their average weight, which is reported this year at 474.28 lbs. against 486.69 lbs. last year.

Canal Traffic.

The business of the New York state canals for the week ending June 30 is reported as follows by the Canal Auditor:

	1882.	1881.	Decrease.	P. c.
Tons shipped	194,018	226,775	32,757	15.5
Miles cleared by boats	227,602	293,803	66,201	32.7
Tolls	$22,530	$24,444	$1,914	7.8

The leading articles shipped were, in tons:

	1882.	1881.	Decrease.	P. c.
Lumber	69,253	71,244	1,991	2.8
Grain	32,085	34,534	2,449	7.1
Iron and iron ore	18,525	27,827	9,302	33.4
Salt	3,057	5,085	2,028	39.9
Stone, lime and clay	12,823	12,358	*465	3.8
Coal	46,256	56,568	10,312	18.2
Sugar and molasses	372	2,238	1,866	83.4
Domestic woolens and cottons	122	1,360	1,238	91.0

* Increase.

The traffic, in grain especially, was made small this week last year by the low rates of the railroad war. It might have been supposed that the difficulty of shipping by rail, due to the New York strike, would stimulate shipments of such things as sugar, molasses, woolens and cottons by canal, but we see that the canal shipments of such goods this year were but one-sixth and one seventh of what they were last year.

Southern Railway & Steamship Association.

At the last meeting of the Rate Committee, which began in New York, June 20th, the first and second days were occupied chiefly in minor changes of classifications and adjustment of rates to some local points.

It was decided to make rates to Boston from all points New York rates plus 5 cents per 100 lbs. on all classes.

On the third day discussion was had as to the differences of rates between Richmond, etc., and Charleston and Savannah, etc.

After some time it was agreed by the Richmond & Danville Railroad to maintain such differences as may be made by the General Commissioner, until a conference can be had and a settlement arrived at between the Richmond & Danville Railroad and the other chief parties at interest—Charleston and Savannah lines.

Col. T. M. R. Talcott, Vice-President and General Manager of the Richmond & Danville Railroad, was present and agreed to the above for his company, the representatives of Charleston and Savannah lines present also agreeing to the same.

The following protest was submitted, signed by Messrs. J. M. Culp, E. P. Wilson and J. M. Brown :

"The undersigned members of the Rate Committee, while recognizing that the proposed rates from Richmond and Norfolk are a protection of Green Line all rail rates, desire to enter upon the record their protest against the rates, as not being sufficient to carry out the provisions of the original contract between the Eastern and Green Lines by which the Eastern Lines were to charge to Atlanta, Athens, Augusta and other points conceded to the Green Line on Western products, higher rates than the Green Line, to protect that line in that business, and for which protection the Green Line agreed to protect the Eastern Lines in the merchandise and cotton business between the East and such points.

"They ask that this protest be made a part of the record."

The members of the Committee held an informal conference with representatives of the lines beyond New York, who were present by invitation, upon questions of mutual interest, as claims, prompt forwarding and marking and condition of shipments of cotton. It was resolved that the General Commissioner be requested to issue a circular calling the attention of agents and also of compresses in the interior, to the necessity of cotton being in good order and plainly marked, and suggesting that all cotton be tagged as well as marked, and asking that compresses re-mark all cotton passing through them.

Southwestern Railway Association Rates.

A dispatch from Chicago, July 11, says: "Commissioner Midgley, of the Southwestern Railway Association, announces that, commencing Aug. 1, the freight rates for grain from Missouri River points will be advanced 5 cents per 100 pounds."

THE SCRAP HEAP.

Locomotive Building.

The Rhode Island Locomotive Works in Providence are building 10 heavy passenger engines for the Chicago, Milwaukee & St. Paul road, and 10 engines—consolidation, passenger and shifting—for the New York & New England. These works have built several twelve-wheeled freight engines of the pattern described and illustrated in the *Railroad Gazette* of last week, and these engines have worked very satisfactorily, so much so, that they have now orders for several more of the same class, and inquiries for still others. These works are very busy and are running with a full force.

The Rogers Locomotive Works in Paterson, N. J., are building nine heavy passenger engines, with 18 by 24 in. cylinders and 68 in. drivers, for the New York, West Shore & Buffalo road. They will burn anthracite coal, and weigh 48 tons each.

The Grant Locomotive Works in Paterson, N. J., are building several engines for the Western Marylaud road.

The Chicago & Alton Shops in Bloomington, Ill., are building six new locomotives for the road.

The Pittsburgh Locomotive Works in Pittsburgh, Pa., have made a short stop for repairs to the machinery, and to put in a lot of new tools and other machinery.

The Central Pacific shops in Sacramento, Cal., are soon to begin work on a number of heavy freight engines of the consolidation pattern, similar to one recently built in the shops and now in use on the heavy grades through the Tehachepi Pass, on the Southern Pacific. In all 25 of these engines are to be built.

Car Notes.

The Wason Manufacturing Co. at Brightwood (Springfield), Mass., is building five passenger cars for the Cleveland, Columbus, Cincinnati & Indianapolis, four for the Gulf, Colorado & Santa Fe, two drawing-room cars for the Housatonic road, and freight cars for the Old Colony and the Panama roads.

Bowers, Dure & Co., in Wilmington, Del., have lately built six passenger cars for the Lehigh Valley, and 20 for the Long Island road. These are all of a pattern approaching the Pennsylvania Railroad standard.

The Chicago & Alton shops in Bloomington, Ill., have lately completed 100 new stock cars.

Billmeyer & Small, at York, Pa., are building 10 open excursion cars, and several freight cars for the Baltimore & Delta road.

The new shops of the Ensign Manufacturing Co., at Huntington, W. Va., are rapidly approaching completion, and are already turning out several cars a day. The new foundry is 70 by 130 ft. It will be devoted exclusively to car wheels, and has a capacity of 160 per day. The woodworking shop is 100 by 208 ft., the machine and blacksmith shop, 88 by 240 ft.; and the erecting shop, 100 by 200 ft. The new axle shop, 69 by 90 ft., is supplied with two Watts steam helve hammers, built by the South Boston Iron Co., and it will be able to make 40 axles a day. The shops are fully equipped with machinery, and when the axle shop and foundry are in complete working order, the company will be able to employ 500 men and turn out over 15 cars a day. They are now employing over 250 men. The officers of the company are W. H. Barnum, President; E. Ensign, Secretary and Treasurer; F. E. Canda, General Manager; Richard Woods, Superintendent.—*Car Builder.*

The Jackson & Sharp Co., in Wilmington, Del., is building 10 open excursion cars for the Baltimore & Delta road.

The St. Charles Car Manufacturing Co., in St. Charles, Mo., is building a number of box and flat cars for the Canadian Pacific road.

The Barney & Smith Manufacturing Co., in Dayton, O., is completing an order for passenger cars for the Lake Shore & Michigan Southern road.

Bridge Notes.

Alden & Lassig, of the Rochester Bridge & Iron Works, are at work on several bridges for the New York, Lackawanna & Western road.

The Passaic Rolling Mill Co., at Paterson, N. J., recently completed a bridge near Wayland, N. Y., on the New York, Lackawanna & Western road, with one span of 80 feet and three of 150 feet each.

Iron and Manufacturing Notes.

A large addition has been built to the Carbon Rolling Mill at Weissport, Pa., including a new train of merchant rolls.

The open-hearth plant of the Siemens-Anderson Steel Works at Linden, near Pittsburgh, which was bought by Lewis, Lloyd & Loomis, was to be started up this week.

The Bethlehem Iron Co., at Bethlehem, Pa., is using ores from Canada, England, Spain, the Island of Elba and Africa in making Bessemer pig iron.

The works of the National Tube Works Co., at McKeesport, Pa., are closed for repairs.

The old Blair Steel Works at Glenwood, Pa., were recently sold and will be started up soon.

Tyrone Forge at Tyrone, Pa., is to be leased to parties who intend to run it and make blooms from charcoal pig iron.

The Bethlehem Iron Co. at Bethlehem, Pa., is running on a large contract for steel rails for the New York, Lackawanna & Western road.

The firm of Goodell & Waters, manufacturers of woodworking machinery and iron-founders in Philadelphia, was dissolved July 1 by mutual consent, Austin W. Goodell retiring. Mr. Waters will settle the business. A new copartnership has been formed by Daniel A. Waters and Wm. G. Vernon, under the firm name of Goodell & Waters, and they will continue the business as successors to the old firm.

The Rail Market.

But little business is reported in steel rails, and sales have been chiefly of small lots. Quotations continue $49 to $50 per ton at mill for heavy sections, and $51 to $52 for light rails.

Iron rails are very quiet at $45 to $48 per ton at mill, according to section, with few sales reported.

Spikes are unchanged at $3 to $3.10 per 100 lbs.; fishplates, $2.50 to $2.60, and track-bolts, $3.75 to $4.

Old iron rails are nominal at about $27 per ton in Philadelphia for tees, and $28 for double-heads, with no sales reported.

The Iron Strike.

The iron strike at Pittsburgh promises to be memorable as the long strike. Both parties are quietly persisting, and there has been but little change during the past week, although one or two small mills are reported as having signed the iron-workers' scale. There are said to be indications of a disposition to compromise, but they are not apparent on the surface. It is, as far as the Pittsburgh men are concerned, one of the most peaceable strikes on record, and both parties, while persistent, seem to be entirely good-natured about it. Persons familiar with the situation predict a compromise within two weeks, but their reasons for such prophesies are not apparent.

A Husband's Preparations.

The other morning when a Detroiter seated his wife in a car on the Michigan Central to make the journey to Chicago alone, he took a look around him and said to her:

"Now, love, if you should want the window raised, here are a dozen gentlemen who will break their necks to accomodate you."

"Yes, dear."

"If you feel lonesome and want somebody to talk with about affairs in Egypt, Noah's ark or the ice period, don't hesitate to call upon any of these gentlemen."

"I understand."

"You won't know enough to leave the car at noon and get your dinner, and you had better ask some of them to accompany you. If they offer to pay for your meal don't be squeamish about it."

"Of course not."

"You may want to read to pass away time. If so, any of

these gentlemen will be only too happy to purchase you half a bushel of the latest books and magazines. Be careful to save 'em for me to read when you get home."

"I'll be certain, love."

"And you can say to them that we have been married four years; we do not live happily together; I am a domestic tyrant; you have strong thoughts of procuring a divorce; you feel that you could love the right sort of a husband; you like oranges and peanuts; you are innocent and confiding; you have never traveled; you are afraid of getting lost in Chicago, and you will be ever so much obliged to any one who will get you a hack, see to your trunk and pay all the expense. Good-bye, love."

"Good-bye, darl."

And wasn't it strange that not one single man in that car even spoke to that lady in a ride of 300 miles?—*Detroit Free Press.*

A Hole in It.

"Gentlemen, I want to announce right here," he said, as he stood up and laid his hand on the shoulder of the sleeping-car porter, "that this man is an honest fellow. In my absent-mindedness, a few minutes ago, I gave him half a dollar for a quarter. He has returned it to me." "Yes, sah—yes, sah," replied the porter, as he ducked his head and scraped his foot, "yes, sah, kase it's got a hole in it, sah, an' I reckoned you was tryin' to beat me outer ten cents."—*Detroit Free Press*

The ball-room car is the latest novelty introduced on the Chicago, Milwaukee & St. Paul road, and recently a merry party of St. Louis belles and beaux made an excursion over the road and danced the racquet with the train moving along at 40 miles an hour. The ball-room was in a large baggage car, 60 ft. long by 15 ft. wide. The floor was elegantly carpeted, the walls beautifully painted, hung with pictures and decorated with bunting, evergreens and garlands of roses. There was an orchestra of eight pieces, and refreshments were passed around through the train every hour, so that with the music, dancing and other good things, the trip was divinely unique and delightful.

An Imposter.

Mr. A. B. Leet, General Freight and Passenger Agent of the Grand Rapids & Indiana Railroad, has sent the following circular letter to the general freight and passenger agents throughout the country, in which he says:

"Letters signed A. B. Leet, per C. A. Ransom, dated June 28, 30, and perhaps other dates, requesting passes for T. O. Callender, are being presented to general freight and passenger agents throughout the country. I beg leave to inform you that I know no such persons as T. O. Callender or C. A. Ransom, and all such letters are spurious."

OLD AND NEW ROADS.

Adirondack.—The bondholders who bought the Adirondack road at foreclosure sale have organized a new company under the same name, and filed the necessary certificates. The capital stock is fixed at $4,000,000. The road is to run from Saratoga, N. Y., to Ogdensburg, 185 miles; it is completed from Saratoga to North Creek, 58 miles.

Alliance, Niles & Ashtabula.—Track is now all laid on this road, and will soon be opened for business. It is 26 miles long, from Alliance, O., northeast to Niles. It is owned by the Pennsylvania Company, and is a cross-cut connection from the Pittsburgh, Ft. Wayne & Chicago at Alliance to the Ashtabula & Pitsburgh road, which will probably be of value to the company.

Bradford & Tiona.—This company has been organized to build a narrow-gauge road from a point on the Olean, Bradford & Warren road to Tiona, Pa., a distance of 12 miles.

Bridgeton & Saco Valley.—Contracts for grading this road have been let to Wm. Fessenden & Sons, of Denmark, Me.; Michael O'Neill, of Cumberland Mills, Me., and A. & P. B. Young, of Hiram, Me. They are to begin work at once. The road is to run from Bridgeton, Me., by Denmark to Hiram on the Portland & Ogdensburg road, a distance of about 15 miles.

Broadway Connecting Underground.—The New York Supreme Court has decided against the application of Origen Vanderburg and others to have the present board of directors displaced. The Court holds that the recent election was legal, and that the directors were properly and legally chosen.

Buffalo, Pittsburgh & Western.—On the Buffalo Extension of this road track is now laid from Brocton, N. Y., northeast to Dunkirk, nine miles, and trains have begun running to Dunkirk. This section of the road is graded and owned in common by this company and the New York, Chicago & St. Louis, but each company, we believe, is to have its own track.

California Short Line.—This company has been organized to build a narrow-gauge railroad from Salina, Utah, on the Sevier River, to Springville, where a connection will be made with the Denver & Rio Grade. The road will be about 100 miles long. Surveys have been made, and work will be begun soon.

Camden, Gloucester & Mt. Ephraim.—Several routes are under consideration for an extension of this road from its present termmus at Mt. Ephraim, N. J., eastward.

Canada-Atlantic.—Work is progressing steadily on this road, and trains will run from Ottawa to Coteau Landing, on the St. Lawrence, a distance of 82 miles, early in August. From Valleyfield, on the south side of the Lawrence, opposite Coteau Landing, the line has not yet all been located, although the entrance into Vermont will be in Alburg, and the junction with the Central Vermont at Alburg Springs, where work has been begun. Work has also been begun on the bridge over the Sorel River at Ash Island, in Lacolle.

Canadian Pacific.—The trustees give notice that they are prepared to receive proposals for the sale to them of land grant bonds to the amount of $150,000, they having received that amount of cash from the proceeds of land sales. Offers to sell should be sent to the Bank of Montreal by noon of Aug. 12 next.

A large force is reported at work on the road west of Winnipeg.

Carson & Colorado.—Track on this road is now laid to the White Mountain Summit, 25 miles beyond Belleville, Nev., and 175 miles from the junction with the Virginia & Truckee road at Mound House. Regular trains run to Candelaria, 158 miles from Mound House.

Chesapeake, Ohio & Southwestern.—The last rail on the gap of 32 miles between Dyersburg, Tenn., and the Hatchie River was laid July 13. This completes the line of 317 miles from Louisville by Paducah to Memphis, and carries the Chesapeake & Ohio road through to the Mississippi. The road will be opened to travel in about ten days.

Chicago, Burlington & Quincy.—It is said that surveys are being made for a cut-off line from Hastings, Neb., on the Burlington & Missouri River main line, southwest to Arapahoe on the Republican Valley line, a distance of about 80 miles. The object is to avoid the present detour by Red Cloud, and to shorten the Denver line. The saving in distance would be about 25 miles.

Chicago & Eastern Illinois.—A dispatch from Chicago, July 7, says: "In the United States Circuit Court this afternoon, before Judges Harlan and Drummond, in the case of Fosdick and Fish against the Chicago, Danville & Vincennes Railroad Company, a petition of the trustees to file a supplemental bill was allowed. The Court refused any order of reference at this time, and will in no event make an order till the parties are at issue. The Court said that while the issues are being made the case pending in the United States Supreme Court will be disposed of, which may settle the controversy in this case. The case in the Supreme Court, referred to above, is the one in which a petition for a rehearing was granted, and upon which the Chicago & Eastern Illinois Railroad Company gained its title. It is evident that the Court expects to be guided by the decision in that case."

Chicago & Iowa.—It is expected that this road will very soon be released from the receivership by the Court, and turned over to the company. As the Chicago, Burlington & Quincy now has an undisputed controlling interest in the stock, the road will be worked in the interest of that company, though the separate organization will probably be maintained.

Chicago & Western Indiana.—This company has just completed a large round-house and a freight yard for the use of the Louisville, New Albany & Chicago road. It is building another large round-house for the Chicago & Atlantic engines, and a third for the engines used on its own road in switching and on the south Chicago Branch.

Chippewa Valley & Superior.—Track is reported all laid on this road, which extends from Eau Claire, Wis., southwest along the Chippewa Valley to a point on the Mississippi opposite Wabasha, Minn. It is 47 miles long, and has been built in the Milwaukee & St. Paul interest. A connection across the Mississippi is to be made by a pontoon bridge.

Cincinnati, Wabash & Michigan.—Grading on the extension of this road is nearly finished from the new terminus at Niles, Mich., north by west to Benton Harbor, 22 miles. Tracklaying will be begun at once.

Denver Circle.—This company was organized some time ago to build a belt or connecting line around the city of Denver, Col., connecting all the roads entering the city. The company has just completed a section of four miles, which is used as a passenger or excursion line on which trains are running to the Mining Exposition grounds.

East Tennessee & Western North Carolina.—Arrangements have been made to extend this road from the present terminus at Cranberry Mines, N. C., eastward about eight miles to the Claywell iron estate, which has lately been bought by some Pennsylvania parties.

Evansville & Terre Haute.—Grading is nearly done on the extension of this company's Cynthiana Branch from Cynthiana, Ind., southward to Mt. Vernon, 25 miles, and tracklaying is well advanced. This extension is known as the Mt. Vernon & New Harmony road.

Gainesville, Jefferson & Southern.—Track on this road is now laid to Jug Tavern, Ga., 25 miles southward from Gainesville, where the road connects with the Atalanta & Charlotte Air Line. This branch of the road will probably be extended to Monroe, 42 miles from Gainesville, where it will connect with the Walton road.

Work is progressing on the other branch of the road, to Jefferson and Athens.

Garfield & Cherry Grove.—This company has been organized to build a railroad from the new oil town of Garfield, Pa., to a point on the Philadelphia & Erie road between Sheffield and Tiona. The distance is about 15 miles.

Garfield & Tionesta.—This company has filed articles of incorporation to build a narrow-gauge road from the new oil town of Garfield, Pa., to Tionesta, in Forest County, about 20 miles.

Georgia Pacific.—Trains on this road will, in a few days, run through to Villa Rica, Ga., 36 miles from Atlanta. Nearly all the grading is now completed to Anniston, Ala., 100 miles from Atlanta.

Houston & Texas Central.—On the branch from the main line at Garrett, Tex., 31 miles south of Dallas, the grading is completed from Garrett northeast to Terrell on the Texas & Pacific, 30 miles, and tracklaying is in progress. This branch has been reported to be the beginning of an independent connection across the Indian Territory.

Illinois Central.—There is likely to be some further controversy over this company's lake front property in Chicago, as a number of property-owners interested are trying to secure the opening of several streets through to the lake over the company's tracks.

Chicago papers report that this company has decided to build a fine new passenger station in Chicago on the site of the present station. It will be much larger than the old building, and will be fitted up in the best manner. It will be owned and used jointly with the Michigan Central, like the old station, and will also be used by the Baltimore & Ohio and the New York, Chicago & St. Louis.

The company is extending the third and fourth tracks, used for local trains, from Park Side to Grand Crossing. Preparations are being made to build two additional tracks from Sixteenth street in Chicago to Grand Crossing, which will make a six-track entrance into Chicago.

The company's statement for July shows earnings as follows:

	1882.	1881.	Decrease.	P. c.
In Illinois	$520,810	$629,280	$108,470	17.2
In Iowa	142,936	174,607	31,671	18.1
Total	$663,746	$803,887	$140,141	17.4

During June, 1882, the land sales were 808.59 acres for $5,047.20, and the cash collected on land contracts was $6,489.75.

Kankakee Valley.—This company has been organized to build a railroad from South Bend, Ind., to Momence, Ill., along the Kankakee River. The capital stock is to be $1,600,000. The plan is to dredge and straighten the Kankakee and use the dirt for grading the road-bed. The improvement of the Kankakee River will reclaim a large area of overflowed lands in Indiana and Illinois.

Kansas & Nebraska.—This company has been organized to build a railroad from Ft. Scott, Kan., to Lincoln, Neb., 280 miles. Office in Ft. Scott.

Kansas City, Springfield & Memphis.—This road was this week formally opened to Seymour in Webster County, Mo., 33 miles east by south from Springfield. The opening was celebrated by an excursion over the road, and a public banquet and address at Seymour. This road is the Kansas City, Fort Scott & Gulf's southeastern extension.

Kennebunkport.—The building of this road has been decided on and work will be begun as soon as possible. It will be be 4½ miles long, from Kennebunk, Me., on the Boston & Maine road, to Kennebunkport. The line will follow the Mousam River and the sea shore, and will be generally easy of construction. It will do a considerable local business, besides much summer travel. The Boston & Maine Company will lease the road at 4½ per cent. on $65,000, its estimated cost, which will make the yearly rental $650 per mile.

Land Grant Railroads.—The report of the Commissioner of the General Land Office prepared in reply to an inquiry of the House Judiciary Committee, concerning the amount of lands certified to certain railroad companies in excess of that to which they were entitled, was made last week. The report says that it must be understood that none of the grants in question have been adjusted, and there are mooted questions relative to the true intent of some of the grants which, when finally decided, may reduce the amounts of land reported due to some of these roads. Each statement, however, made with reference to a particular road, he says, represents as nearly as practicable such amounts as would inure to the road under the present rules of the Interior Department. The following is a summary of the Commissioner's exhibit of the total acreage certified to each of the fourteen roads, the deficiency due to some and the excess received by others:

Roads.	Acres certified to roads.	Deficiency.	Excess.
Cedar Rapids & Missouri Riv., Iowa	1,032,363	249,636	.....
Sioux City & St. Paul, Iowa	407,910	.....	47,910
St. Paul & Sioux City, Minnesota	1,146,738	128,461	.....
First Div. St. Paul & Pacific, Minn	1,251,046	177,753	.....
Iowa Falls & Sioux City, Iowa	1,155,956	38,520	.....
Winona & St. Peter, Minnesota	1,068,787	246,412	.....
Lake Superior & Mississippi, Minn	860,504	127,723	.....
West Wisconsin, Wisconsin	824,866	462,734	.....
Alabama & Chattanooga, Alabama	558,253	342,069	.....
Mobile & Girard, Alabama	504,145	.....	482,422
Coosa & Tennessee, Alabama	.....	.....	67,784
Pensacola & Georgia, Florida	1,275,579	.....	622,779
North Louisiana & Texas, Texas	353,212	84,547	.....
Iowa Central Air Line R. R.	63,106	.....	.....

Commissioner McFarland says in conclusion: "It appears from the records of this office that at the commencement of the execution of the laws relating to land grants, no proper books of account were opened, and no careful basis prepared upon which to proceed with the administration of the law, and it is not adequate now for me to enter upon such work of adjustment without neglecting the current business of the division, which would be very injurious to parties interested."

Louisville & Nashville.—This company makes the following statement for the six months ending June 30, June partly estimated:

	1882.	1881.	Inc. or Dec.	P. c.
Earnings	$6,084,664	$5,447,516	I. $607,148	11.1
Expenses	3,556,463	3,466,819	I. 79,653	2.3
Net earnings	$2,528,201	$2,010,706	I. $517,495	25.7
Per cent. of exps.	58.4	63.3	D. 4.9	....

The mileage worked was 2,028 miles this year, against 1,840 last year, the addition being the Louisville, Cincinnati & Lexington lines.

Marietta & Cincinnati.—The Cincinnati *Commercial* of July 6 says: "The Baltimore & Ohio Railway, through J. L. Keck, yesterday bought the 11,250 shares held by what is known as the minority pool of the Cincinnati & Baltimore Railroad, and agreed further to assume the $500,000 bonded indebtedness of the road, the latter bearing 7 per cent. interest. The price to be paid is $110 per share of $100, and the money is to be deposited in the Citizens' National Bank, on or before Aug. 1 next, by which date the stock is to be delivered to the same bank. * * * The Cincinnati & Baltimore Company owns the six miles of track between the Cincinnati, Indianapolis, Chicago & St. Louis track and Ludlow Grove over which the Baltimore & Ohio and Marietta & Cincinnati railroads enter this city."

The holders of this stock have heretofore refused to accept the terms offered them in the reorganization of the Marietta & Cincinnati. They have ratified the sale of the stock, which removes the difficulties in this direction.

Another complication seems to have arisen, of which the Cincinnati *Commercial* says: "The records show no title in the Marietta & Cincinnati Company to that part of the Hillsboro & Cincinnati road between Blanchester and Loveland, a distance of 16 miles; that they only took possession of it as part of their main line, under a contract with the Hillsboro & Cincinnati Company, and have failed to acquire any permanent right of possession. An answer and cross-petition have lately been filed in the Ross County foreclosure case, on behalf of the Hillsboro & Cincinnati Railroad and its creditors and bondholders, denying that the Marietta & Cincinnati Company has ever had any but a temporary right of possession, and praying that the railroad from Hillsboro to Loveland be restored to the Hillsboro & Cincinnati Company. Of course, if the main line of the Marietta & Cincinnati is broken at Blanchester, it will be left out in the cold, and some measures will be speedily taken to close this 16-mile gap by a purchase or a compromise. The capitalization scheme will probably be amended so as to take in the Hillsboro & Cincinnati creditors and stockholders.

Marietta & North Georgia.—Track is now laid to Ball Ground, Ga., 13 miles northward from the late terminus at Canton and 37 miles from Marietta. Work is progressing on the line from Ball Ground to Jasper, 13 miles.

Martin's Creek.—It is now proposed to build this road from the Bangor & Portland road near Portland, Pa., to the Delaware and down the west bank of that river to Easton and thence to a connection with the North Pennsylvania road near Bethlehem. It is said that the Reading Company will aid the project.

Massachusetts Central.—The Boston *Advertiser* of July 10, says: "At a meeting of the directors on Thursday afternoon the subject of plans for the completion of the road, now that the efforts of the bondholders have apparently failed to raise the money required, was considered. A scheme that received considerable attention, and one that will be presented to some of the principal bondholders, and be further considered at an adjourned meeting of the directors this week, looks to the present bondholders giving up their bonds into the hands of trustees, and receiving preferred stock in a new organization to be permitted by next winter's Legislature. To complete the road and furnish it with adequate equipment it is proposed to issue new bonds to the extent of $1,000,000 at 6 per cent. The controlling power would be vested in the preferred stock by their enjoying double the voting power of the common stock which would receive nothing until the preferred had received 6 per cent. dividends. Some such scheme as this will be necessary to prevent foreclosure proceedings, which can be commenced next January, the road having now defaulted upon its July coupons. The matter is to be further con-

sidered at the adjourned meeting and it is expected something definite will be decided upon then."

Meriden & Cromwell.—This company has been fully organized and stock subscriptions have been secured to an amount sufficient to build the road. It is to extend from Meriden, Conn., to Cromwell, about 10 miles. It is to connect with the Hartford & Connecticut Valley road, its object being to give the Meriden manufacturers an independent outlet.

Mexican National.—Work on this road is progressing favorably, and it is expected that the rails will be laid to Monterey by Sept. 1. Work has been resumed on the branch line from Monterey to Matamoros.

Missouri, Kansas & Texas.—Work is in progress on a branch from the Southwestern Division at Miller, Tex., westward to Belton, about seven miles. This branch is parallel to the Gulf, Colorado & Santa Fe track.

Montreal, Ottawa & Western.—This company has begun work on a line which is to extend from St. Jerome, P. Q., to Ste. Agathe, and thence by Desert to Lake Temiscamingue and a connection with the Canadian Pacific road It will be about 200 miles long.

Natchez, Jackson & Columbus.—Track on this road is now laid to Raymond, Miss., 14 miles northeast from the late terminus at Utica, and 81 miles from Natchez. There remain 17 miles to reach Jackson, and the grading is very nearly finished.

Nebraska, Topeka, Iola & Memphis.—Grading is well advanced on this road from Girard, Kan., northwest to Iola, 42 miles, and tracklaying has been begun.

New York Freight Handlers' Strike.—The freight handlers' strike in New York and Jersey City still continues. The companies continue firm in their refusal to concede the advance asked by the old men, and have all collected forces of new men, who are at work, and manage to do the loading and unloading required in a more or less satisfactory way. This week, however, there has been some trouble with the new men, especially with the gangs of Italians employed, who are hard to manage, very suspicious, and afraid of violence from the strikers. The first trouble on a large scale from the strike happened on Tuesday, at the Erie Station, in Jersey City. A number of the old men entered the station to receive the money due them on the June pay-rolls, when some Italians at work there, seeing the crowd, and believing that they were about to be attacked, commenced firing with revolvers; in the fight that followed, several men were hurt before the police put a stop to the riot. Many other small fights are reported, and this affair gave rise to much bad feeling, so that a number of Italians and other immigrants who have been employed left their work. The companies say that they have no trouble in handling all the freight offered, but the strikers still profess to have confidence in their final success.

New York, Lackawanna & Western.—Track is reported laid on 185 miles of this road, leaving only to be filled a gap of 15 miles near Mt. Morris, N. Y., and the entrance into Buffalo, the whole length of the road from Binghamton to Buffalo being 204 miles. Work is progressing steadily, and the Mt. Morris gap will be filled before long. Probably the last track to be laid will be in Buffalo.

New York & New England.—Notice is given that the 34,750 shares of stock, of the par value of $100 each, which have beeen held by the commonwealth of Massachusetts, and which are now at the disposition of the company, are hereby offered at $50 a share to the stockholders of the company in proportion to the stock owned by them respectively, as shown by the company's books on August 2. 1882.

All subscriptions for said stock must be signed by the stockholder making the same or his attorney or assignee, and given in to the Treasurer of the company on or before Aug. 15, and will be payable in five instalments of $10 for each share subscribed for; the first payable 10 days after notice of call, and the rest at intervals of not less than one month each thereafter. Forms for subscriptions will be sent to the present stockholders, and can be had by writing to the Treasurer. The transfer books will be closed from Aug. 2 to Aug. 16, both days inclusive. Holders of the Berdell bonds still unconverted must convert them into stock of the present company before Aug. 1, in order to entitle them to subscribe for the stock.

Northeastern, of Georgia.—The track on this road is now laid to Tallulah Falls, Ga., 4½ miles beyond the late terminus at Turnersville, and 21½ miles from Rabun Gap Junction on the Atlanta & Charlotte Air Line. Tallulah Falls have long been celebrated for the wild and impressive scenery, and there is a large travel there in summer.

Northern Pacific.—It is announced that the syndicate represented by Messrs. Drexel, Morgan & Co., Winslow, Lanier & Co., and August Belmont & Co., declared their option July 1 for $5,000,000 Northern Pacific Railroad general first-mortgage bonds; but the company being unable, for various reasons, to make the delivery, the option has been extended in accordance with the terms of the contract.

On the Northern Pacific, Fergus & Black Hills Branch grading is now nearly completed from the present terminus at Fergus Falls, Minn., westward to Breckenridge on the Red River, about 40 miles. Tracklaying will soon be begun. On the Pelican Rapids Branch of this line the track is now all laid from Fergus Falls northward to Pelican Rapids, 22 miles, and the road was last week accepted from the contractors and formally opened.

Pike Mills & Kettle Creek.—This company has been organized to build a railroad from the Philadelphia & Erie at Westport, Pa., northward to Pike Mills in Potter County, about 40 miles.

Richmond & Mecklenburg.—Track on this road is now laid from the junction with the Richmond & Danville at Keysville, Va., southward to Ft. Mitchell, 11 miles. The road is to be finished to Chase City this fall. It is owned by the Richmond & Danville.

Rio Grande & Mississippi.—The Galveston *News* of July 4 says: "Mr. William Henry Wells, C. E., who is in charge of the survey of the Erlanger routes from the Mississippi River and from Shreveport to Brenham, and two gentlemen of his corps, Messrs. Chamblin and Smith, were in Galveston yesterday. Mr. Wells has already, it is understood, found an admirable line from the mouth of Red River to Brenham, and also a good line to Hempstead. This survey is a part of the line contemplated from Meridian, Miss., on nearly an air-line to the confluence of Red River with the Mississippi, thence to either Hempstead or Brenham, and thence to Presidio, on the Rio Grande—not Eagle Pass, as heretofore stated—via Gonzales, in Gonzales County. Having completed this survey, Mr. Wells turns back on a survey to Shreveport.

"The syndicate already aim a line to Meridian, and from Meridian to Shreveport. The line just surveyed, dipping down to the mouth of Red River from Meridian and entering Texas at Sabine, is intended to form a junction with the main trunk line coming from Shreveport to Presidio at Brenham, Hempstead, or some intermediate point. Mr. Wells, having passed through the Brazos bottom going east, is on a few days' furlough with his whole party. He returns to Anderson this morning to complete the survey to Shreveport. He was much pleased with his reception at Brenham, and the treatment extended to the enterprise by her citizens. They offer liberal inducements for the junction, and their propositions are likely to receive most favorable consideration.

"This section of the Erlanger system is designated as the Rio Grande & Mississippi Railroad, and constitutes no unimportant feature in their Southwestern system. They get away from parallel roads as far as practicable, and in doing so penetrate the piney regions of the country from Meridian to Presidio. Beyond that, across the Republic of Mexico, they will have a wide berth to the Gulf of California, their probable objective point. They ask neither money nor land grants from Texas, but only the right of way and grounds for depots in important towns and cities along their lines. These privileges will surely be granted with alacrity."

Rochester & Pittsburgh.—This company has completed a spur one mile long from East Gainesville, N. Y., to Gainesville. It has been built for the purpose of making connection with the Silver Lake road.

Roswell.—Surveys are being made for an extension of this road from Roswell, Ga., to Cumming, about nine miles.

St. Johnsbury & Lake Champlain.—Reports of a proposed lease of this road are desired. They probably arose from the fact that arrangements have been made by this company and the Montreal, Portland & Boston for a joint lease of the Canada Junction road, now nearly completed from Sheldon, Vt., to the Canada line. This new line will connect the two roads.

St. Louis, Des Moines & Northern.—The correct length of this road from Des Moines, Ia., to Boone is 42.3 miles. The ballasting is nearly done, and regular trains will be put on to Boone about Aug. 1 next.

St. Paul, Minneapolis & Manitoba.—The Land Department sold 61,367 acres in June for $258,758.80, there being 217 different purchasers. One sale of 32,000 acres was made to a company of associates for $5 per acre, with a rebate of $2.50 for breaking. The sales this year promises to be more than twice those of 1881.

Savannah, Florida & Western.—The board has decided that the extension to Chattahoochie, Fla., to connect with the Pensacola & Atlantic road, is to start from Climax, Ga., nine miles east of Bainbridge, instead of from Bainbridge, the terminus of the road. The line from Climax is easier and more direct than that from Bainbridge.

Sinnemahoning & Pine Creek.—This company has been incorporated to build a railroad from Sinnemahoning, Pa., on the Philadelphia & Erie, northward to a point on Pine Creek in Potter County. It will be of 3 ft. gauge and about 27 miles long.

Sioux City & Pacific.—Track on the Nebraska Division has been laid to a point 45 miles west by north from the late terminus at Long Pine, Neb., and 257 miles from Fremont. About ten miles more are graded.

State Line, Brockland & Pine Creek.—This company has been organized to build a narrow-gauge road from a point on the New York state line in Potter County, Pa., southward to Pine Creek, about 20 miles.

Stockton & Mt. Diablo.—This company has been organized to build a railroad from Stockton, Cal., across Roberts and Union islands in the most direct possible line to the Mt. Diablo coal mines.

Tionesta & Clarion.—This company has been organized to build a narrow-gauge road from Fairmount, in Clarion County, Pa., to Eagle Rock, about 50 miles.

Union Pacific.—An extension of the St. Paul Branch has been graded from St. Paul, Neb., westward to North Loup, 28 miles, and track has been laid for 20 miles.

Notice is given that 65 of the collateral trust mortgage bonds have been drawn for redemption under the terms of the mortgage. The numbers drawn are 223, 423, 430, 501, 547, 568, 589, 615, 761, 790, 850, 899, 920, 921, 1181, 1306, 1307, 1457, 1496, 1540, 1585, 1649, 1650, 1692, 1720, 1763, 1956, 1988, 2005, 2023, 2068, 2074, 2196, 2198, 2258, 2492, 2547, 2664, 2693, 2742, 2744, 2975, 3062, 3066, 3158, 3183, 3373, 3404, 3485, 3552, 3557, 3560, 3619, 4062, 4085, 4094, 4106, 4127, 4137 4157, 4344, 4477, 4558, 4996 and 5021. These bonds will be redeemed on Aug. 1 next at 105 and interest, at the office of the Union Trust Company in New York. Interest upon them will cease from that date.

On the Gunnison Branch of the Denver & South Park Division track is now laid to Woodstock, Col., six miles southwest from the late terminus at Hancock, 35 miles from the main line at Buena Vista and 170 miles from Denver. Work is in progress to Pitkin and Gunnison.

Utica, Ithaca & Elmira.—Application has been made to Judge Rumsey, of the New York Supreme Court, for the appointment of a receiver for this road. On account of the number of interests applying to the Court for protection, and the number of persons nominated as receiver, the case has been referred to a master to take testimony and report to the Court.

The road extends from Elmira, N. Y., to Cortland, 71 miles, and the company has also controlled and worked the Cazenovia, Canastota & De Ruyter road, 29 miles, and has worked the Ithaca, Auburn & Western road, 27 miles. The road was sold under foreclosure four years ago, and the present company was then organized. The road has never earned more than its running expenses, and not always that.

Washington & Western.—A suit has been begun to contest the right of the present company to this road, formerly the Washington & Ohio. The complaint in the suit was filed at Alexandria, Va., this week. The present company acquired the road through a foreclosure sale a few months ago.

West & East.—Track on this road is now laid from Durant, Miss., on the Chicago, St. Louis & New Orleans road, west by north to Lexington, 13½ miles, and regular trains will soon be running.

West Jersey.—This company has now 17½ miles of second track, 6½ miles having been finished this year. It has added to its road the Sea Island City Branch, 5¾ miles, and has extended the Salem Branch into Salem, N. J., a little over half a mile, and has built a new station and freight house there.

The grading is nearly completed on the new Woodstown & Swedesboro road, which will run from Swedesboro through Woodstown to a junction with the Salem Branch. It will be 11 miles long, and will shorten considerably the distance between Camden and Salem.

Wheeling & Lake Erie.—Track is reported laid to Toledo, O., six miles west of the last point reported, and 56 miles from Norwalk. The entrance into the city has still to be built.

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Del., Lack. & W. Leased Lines	340	Pittsburgh, Cincinnati & St. L.	262
Delaware Western	41	Pittsburgh & Lake Erie	23
Denver & Rio Grande	71, 344	Portland & Ogdensburg	96
Des Moines & Ft. Dodge	101	Portland & Rochester	126
Detroit, Grand Haven & Mil.	404	Providence & Worcester	246
Eastern R. R. Association	281	Queen Anne's & Kent	386
Eureka & Palisade	324	Richmond, Fred. & Potomac	316
Fitchburg	40	Rochester & Pittsburgh	6
Georgia	340	Ruby Hill	324
Grand Rapids & Indiana	324	St. Louis & San Francisco	41, 175
Grand Trunk	222	St. Paul & Duluth	217
Great Western	289	Sandy River	190
Hannibal & St. Joseph	176	Savannah, Florida & West	217
Han. J'n., Hanover & Gettysb'g	324	South Carolina	189
Housatonic	196	South Carolina Minor R'rds	7
Houston, East & West Texas	191	Sussex	386
Houston & Texas Central	126	Troy & Greenfield	70
Huntingdon & B'd. Top Mt.	101	Union Pacific	175
Illinois Central	96, 125	U. S. Rolling Stock Co.	195
Indiana, Bloom. & West	4 2	Utica & Black River	70
Indianapolis & St. Louis	340	Vermont Valley	403
Iowa Minor Railroads	71	Virginia Midland	142
Junction & Breakwater	345	Virginia & Truckee	190
Kan. City, Ft. Scott & Gulf	311	Wabash, St. L. & Pacific	194, 218
Kentucky Central	315	Western Maryland	7
Knox & Lincoln	142	Western R. R. Association	38
Lake Shore & Mich. So	271, 279	Worcester & Nashua	55
Lehigh Coal & Navigation Co.	126	Wisconsin Central	370

Wilmington & Northern.

This company owns a line from Wilmington, Del., to Reading, Pa., 72 miles, with the French Creek Branch, 6 miles, and the Rockland Mill Branch, 1 mile, being 79 miles in all. An extension to the Delaware River, 3½ miles, is in progress. The report is for the year 1881.

The equipment consists of 15 engines; 6 passenger and 5 combination cars; 48 box, 6 line box, 1 stock, 62 gondola, and 4 caboose cars; 8 service cars.

The general account, condensed, is as follows:

Stock		$1,278,650.00
Funded debt		122,750.00
Accounts and balances		42,186.17
Profit and loss		108,228.71
Total		$1,551,164.88
Road and property	$1,435,934.22	
Materials, etc	39,762.24	
Accounts and balances	36,649.79	
Cash, Del. Extension	28,026.28	
Cash	10,792.35	
		1,551,164.88

The bonded debt was increased during the year by $59,000 bonds sold for the Delaware Extension, for which $100,000 were authorized.

The traffic for the year was as follows:

Passengers carried	154,730
Passenger-miles	1,732,270
Tons freight carried	460,449
Ton-miles	12,611,916
Av. receipts:	
Per passenger-mile	2.87 cts.
Per ton-mile	2.13 cts.

The freight includes 151,448 tons of transfer freight handled at Wilmington, Coatesville, Birdsboro and Reading, the average haul on which was only one mile. Excluding this transfer freight the average receipt per ton—mile was 1.97 cents.

The earnings for the year were as follows:

Freight	$268,983.69
Passengers	49,437.23
Other sources	6,591.14
Total ($4 114 per mile)	$325,012.06
Expenses (79.46 per cent.)	258,247.20
Net earnings ($845 per mile)	$66,764.86
Interest and redemption of bonds	8,790.30
Net balance	$57,974.56
Construction and new equipment	49,579.23
Balance	$8,395.33

The new construction expenses were for new sidings, new water-stations, filling trestles, iron bridges and similar additions to the property. The new equipment added was 2 locomotives and 14 freight cars.

There were 701 tons of new steel rails and 18,351 new ties put in the track. Extensive repairs were made to the buildings, bridges and equipment.

Good progress was made on the Delaware Extension, which includes a branch to South Wilmington, and which is expected to be of great advantage to the road.

As compared with the previous year, there was an increase of $93,384.60, or 40.3 per cent., in gross earnings. The earnings were the largest the road has ever reported.

Oregon Railway & Navigation Company.

The following preliminary statement for the fiscal year ending June 30, covers all this company's lines, railroad, river steamboats and ocean steamers. The June earnings and expenses are partly estimated.

The earnings for the year were as follows:

	1881-82.	1880-81.	Inc. or Dec.	P. c.
Gross earnings	$4,933,001	$3,730,245	I. $1,202,756	32.2
Expenses	2,526,575	2,063,384	I. 463,191	22.5
Net earnings	$2,406,426	$1,666,861	I. $739,565	44.4
Percent. of expenses	51.2	55.3	D. 2.1	

An unusually heavy freshet interrupted navigation on the Columbia for ten days in June, reducing the earnings for that month considerably. Making all allowances for increase in railroad mileage, the gain in earnings for the year is considered very satisfactory.